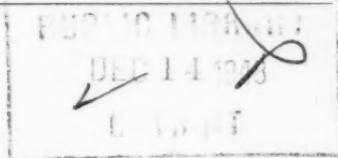


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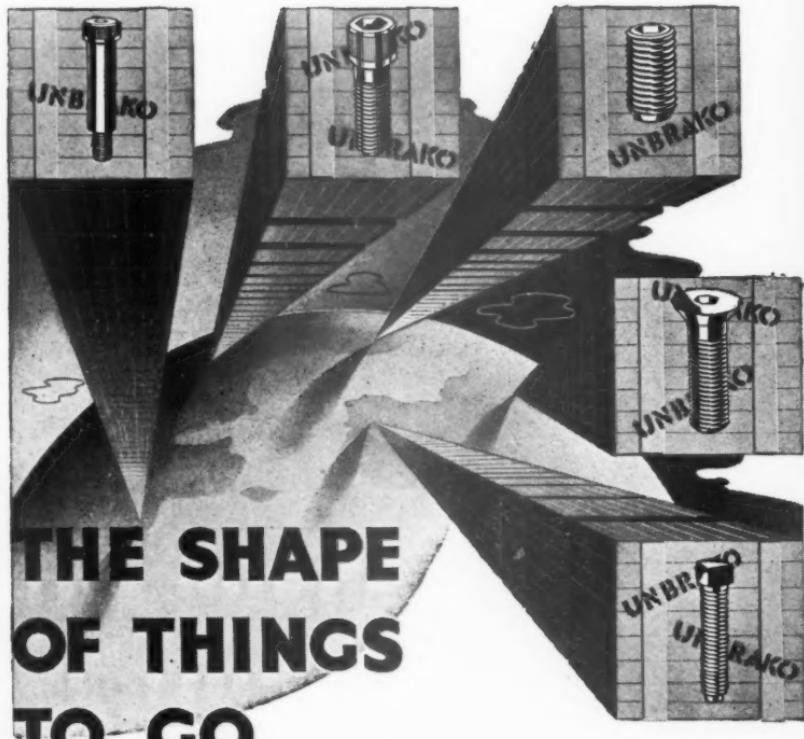


FIRST NATIONAL CONVENTION  
BOURNEMOUTH, 1948.

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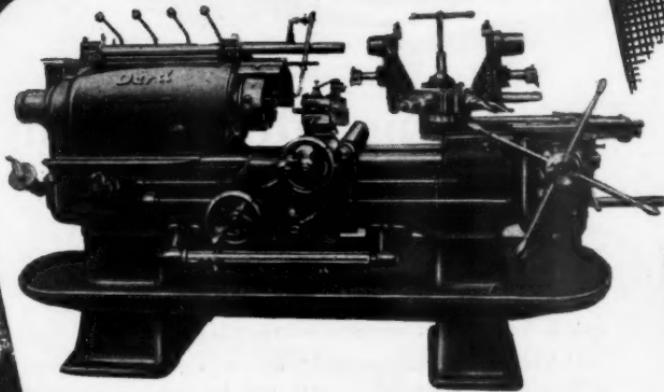
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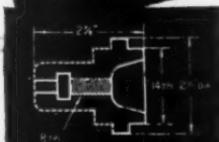
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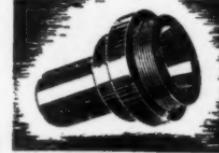
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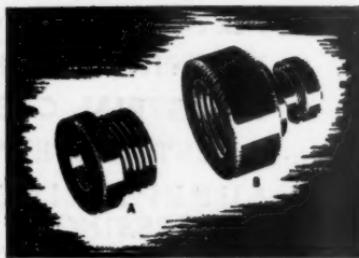


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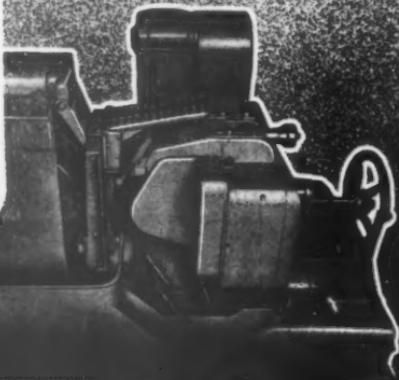
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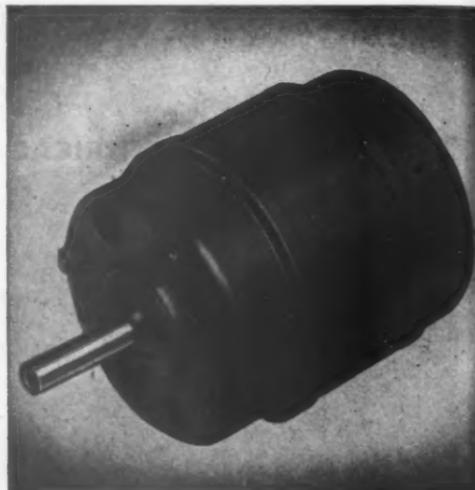
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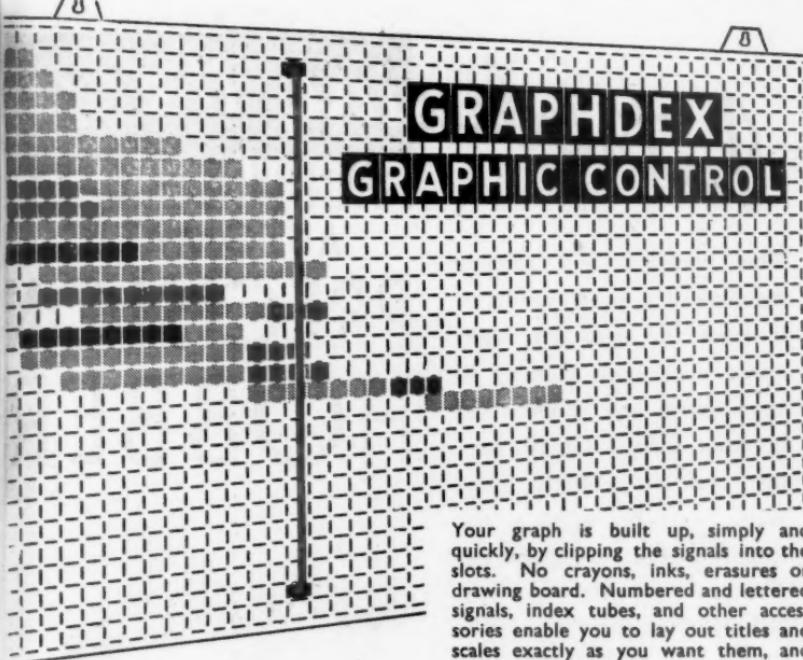
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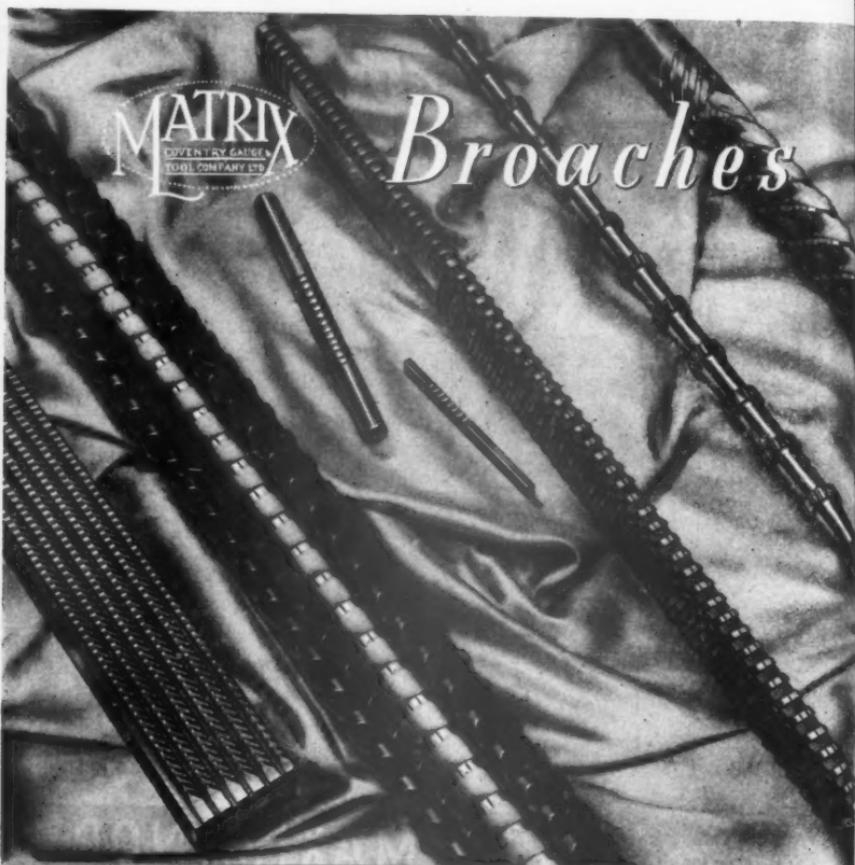


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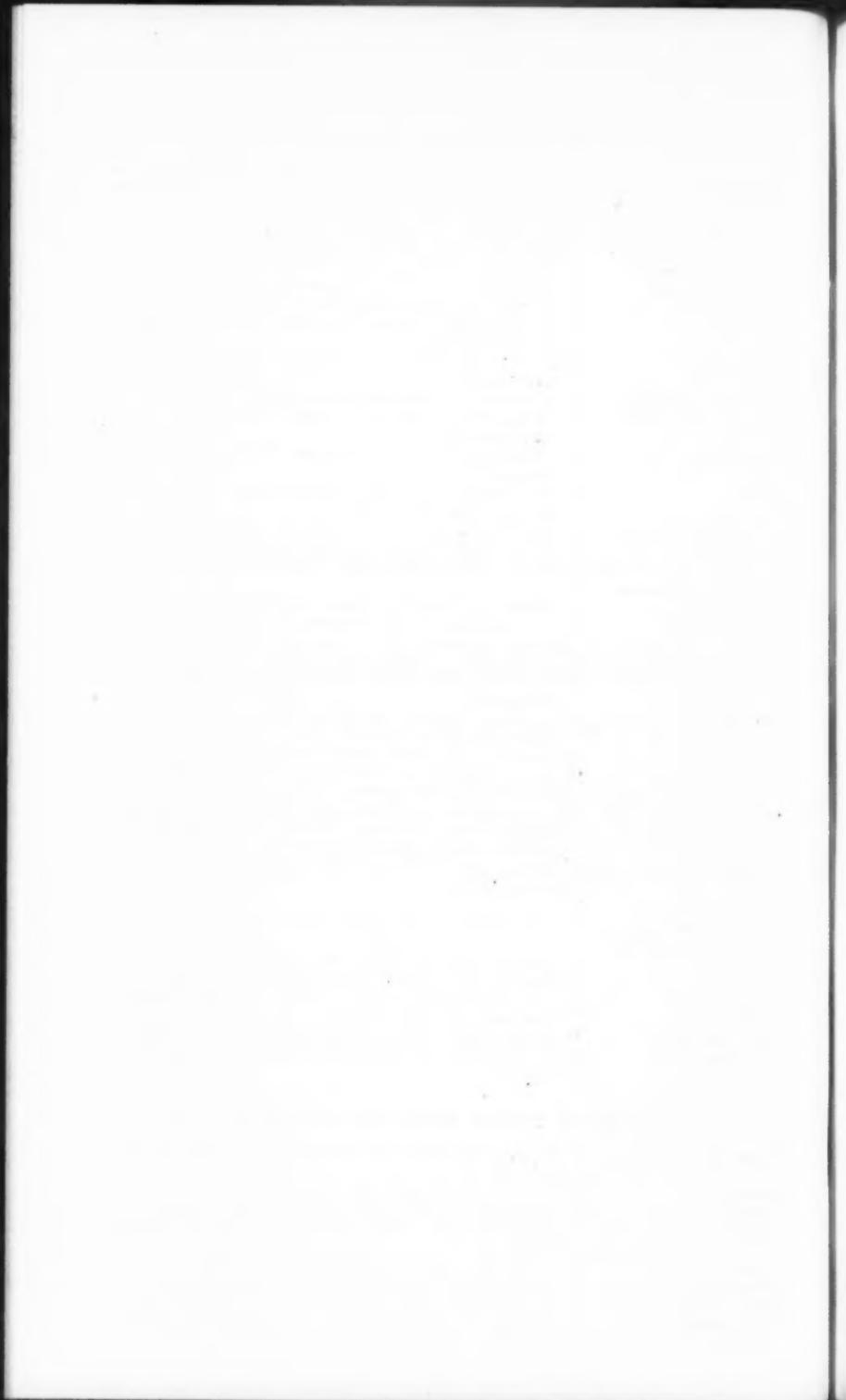
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# FIRST NATIONAL CONVENTION

BOURNEMOUTH, SEPTEMBER 23rd-25th, 1948

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## MESSAGE FROM THE PRESIDENT

It is now apparent that the First National Convention held at Bournemouth was an unqualified success, and I feel that in these published proceedings the Institution should place on record its appreciation of all those who made such an achievement possible.

The Institution was honoured by the attendance of unusually distinguished speakers, who gave addresses of an exceptionally high order to delegates from all parts of the British Commonwealth and the United States of America. Especially do we regard it as of the greatest significance that a man of the calibre of Sir Godfrey Ince, K.C.B., K.B.E., Permanent Secretary, Ministry of Labour and National Service, should remain with us throughout the entire proceedings.

We are sincerely grateful to His Worship the Mayor of Bournemouth, Councillor J. W. Moore, J.P., for his generous help and co-operation in making the occasion a pleasant and memorable one.

Finally, tribute should be paid to those responsible for the efficient organisation of the proceedings, which undoubtedly left with the members a feeling of pride in the Institution to which they are privileged to belong.



**DR. H. SCHOFIELD, C.B.E.,**  
President of the Institution.



**SIR GODFREY INCE, K.C.B., K.B.E.,**  
**Permanent Secretary, Ministry of Labour and National Service.**

## FOREWORD

by SIR GODFREY INCE, K.C.B., K.B.E.,  
*Permanent Secretary, Ministry of Labour and National Service.*

This is a report of the First National Convention of the Institution of Production Engineers held at Bournemouth. All those who read it will, I am sure, realise that it was a most valuable and interesting conference. I had the privilege of being present throughout the proceedings and of listening to the four main addresses by the President of the Institution, General Sir Bernard Paget, Mr. Hancock and Sir Ronald Weeks. All these addresses were of outstanding quality and will repay the most careful study. I regard the time I spent at the Convention as more than worth while and I am sure that must be the opinion of all those who were present. I have only one criticism to make—the Convention was not quite long enough and in consequence did not allow sufficient time for full discussion of the many points raised by the main speakers. Apart from affording an opportunity of hearing the views of distinguished and experienced persons, conferences of this kind enable a most valuable exchange of views to take place between those concerned with similar problems throughout the country.

This recent Convention, although the first held by the Institution, was so successful that I have no doubt it will be the forerunner of many others in the future. The Institution has broken new ground. I hope it will continue to go forward and reap the harvest that I am sure will result from its initiative and enterprise.

Thursday, September 23rd.

**INSTITUTION DINNER**  
**PAVILION BALLROOM, BOURNEMOUTH.**

The toast of "The King" having been honoured, the Chairman called upon Mr. A. L. Stuchbery, Chairman of the Convention Committee, to propose a toast to "The Mayor and Corporation of Bournemouth."

Mr. Stuchbery, in proposing the toast, said that the First National Convention of the Institution of Production Engineers was being inaugurated that evening. It would be agreed that after the loyal toast, their duty was to honour the First Citizen of the City which was entertaining them, and who had done so much to make the Convention possible.

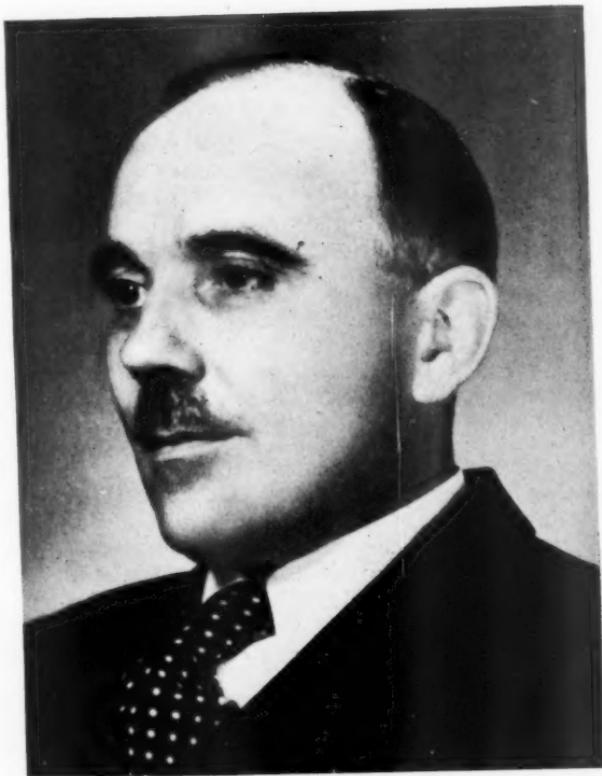
The presence of so many that evening proved their belief in the solid benefits which were to be derived from such conferences. In fact, the Institution might very well make Conventions of this kind a permanent feature of its proceedings.

These meetings afforded an opportunity not only of discussing the problems which presented themselves to production engineers, but also helped to consolidate the general field of experience and to increase an understanding of the service which production engineering as a profession should play in the affairs of the nation.

As conditions are, they were bound to conclude that whatever might confront statesmen in their difficult tasks, production would continue to be one of the primary problems facing the world as a whole. He hoped, therefore, that His Worship the Mayor, in entertaining the delegates, would feel that they had a substantial and worth while task to perform. He also hoped that their friends in Bournemouth would feel they had contributed to the work of production engineering.

Thanks were due to the Mayor's staff, in helping to organise, which was greatly appreciated, as well as to the Mayor and burgesses of Bournemouth for the amenities they had so generously made available. He hoped these would not interfere unduly with the more serious aspects of the Convention, but they would certainly play a very large part in its social side, which was not without importance.

Thanks were also due to the Mayor for his invitation to a Civic Reception on the following day. Undoubtedly the delegates would leave Bournemouth with very happy memories, memories blended with some satisfaction of solid work accomplished. He hoped, too,



**MR. A. L. STUCHBERY, M.I.P.E.**  
**Chairman, Convention Committee,**



that in looking back on the Convention, His Worship and the good people of Bournemouth would realise that they had entertained some worthy individuals who had been trying to do a worth while job, and that this would give them some satisfaction.

The toast "The Mayor and Corporation of Bournemouth" having been honoured, His Worship the Mayor, Councillor J.W. Moore, J.P., responding, said that Bournemouth was honoured that the Institution of Production Engineers should be holding its First National Convention there.

One reason why he welcomed the Convention was the importance of both engineering and production at the present time. For many years the engineering industry of Britain had been foremost in the world, and many of the products of her engineers' brains had played an important part in exports from Britain in pre-war days. Perhaps, in the history of the world, it was never more necessary than at the present time that they should, by their knowledge, skill and ingenuity, do everything possible to increase production. If the recovery drive was to be successful and Britain was again to become the foremost financial nation in the world, it would be brought about through production and export. The Convention was welcomed, therefore, for the important part production engineers were playing and would play in the future.

He hoped there would be time for those present to see some of the beauties of the district. He would refer to them as natural beauties because their predecessors had developed the town without interfering with its natural beauty, and the Council were desirous of maintaining and developing it on the same lines. Bournemouth had no industry. It provided health, recreation, leisure and entertainment. They believed that visitors from the Midlands and the North and from the large industrial centres went back to work more fit from the production point of view for having spent their holidays there, and he felt sure the very kindly reception given to visitors had not escaped notice.

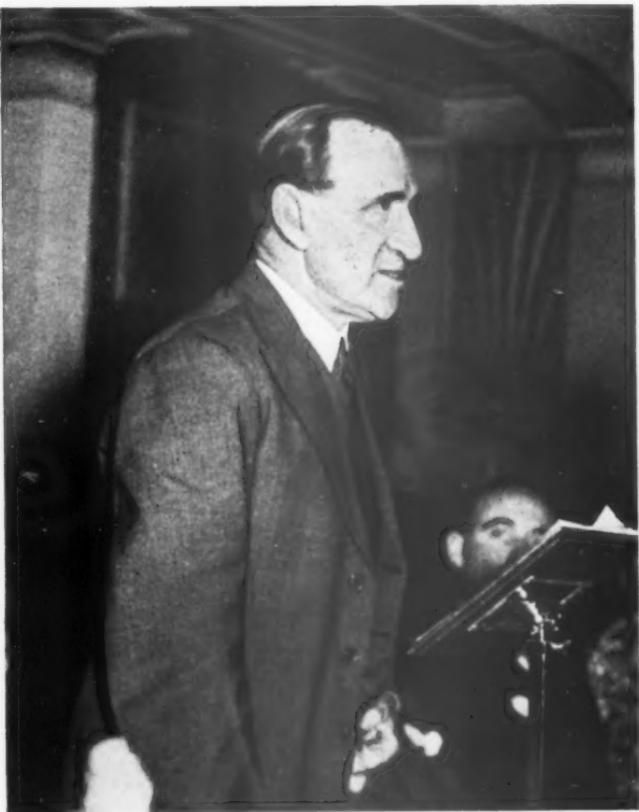
The Mayor of a town such as Bournemouth derived great pleasure from the contacts he was able to make, and it had been his pleasure on the previous day to go over the Signals Research Department at Christchurch. He had been amazed to see the ingenious things which were being produced there, and had been pleased to find that these products were not only for the use of the Army and the Air Force, but also for commerce. This was particularly satisfactory, because it ensured that though it might be necessary to produce instruments for defence, commercial enterprise continued.

FIRST NATIONAL CONVENTION

In his view the President and Members of the Institution had a great responsibility. There was no doubt that they were equal to it and he hoped their stay in Bournemouth would be of advantage. He hoped, too, that they would have happy recollections of their visit and he wished their industry and all of them individually good health, great success and great happiness.

In conclusion, he thanked them for the toast to the County Borough of Bournemouth, and he looked forward with great pleasure to seeing them at the Civic Reception on the following day.

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**GEN. SIR BERNARD PAGET, G.C.B., D.S.O., M.C.**

## LEADERSHIP

by GENERAL SIR BERNARD PAGET, G.C.B., D.S.O., M.C.

*General Sir Bernard Paget, Principal of Ashridge College, is one of Britain's most distinguished soldiers. During the period between the two World Wars he played a prominent part in many of the developments of the modern army, holding important appointments at home and abroad. He has always maintained a great interest in many activities outside his army career and his wide experiences specially fitted him for the post of Principal of Ashridge College, which he accepted on his retirement from the Army in 1946. Courses run at Ashridge during the past year have included "Industrial Leadership", "The Structure of Industry" and "The Social Function of Industry."*

General Paget, proposing the toast, "The Institution of Production Engineers," coupled with the name of Major Thorne, Director and General Secretary of the Institution, said :

I much appreciate the privilege of being invited to speak to you on the subject of Leadership.

I realise that there are many people who are better qualified than I am to do so, both as leaders and as speakers ; also that it is a subject about which so much has been written and spoken recently from every angle, that there is little one can add to the sum total of views expressed.

In studying what others have written and said about it I have been interested to note how much variation there is in their views as to the essential qualities of leadership. This goes to show that it is not a subject which lends itself easily to definition and classification, and that the personal experience and character of the individual play an important part in trying to define what goes to make a leader. This is evident, if one attempts to compare Nelson, Wellington and Napoleon ; or Douglas, Haig, Allenby and Foch ; or Winston Churchill, Eisenhower and Montgomery. They have some qualities in common, but there are also wide differences in character and technique.

I do not propose to make any such comparisons now, nor shall I attempt to give you a list of what I consider to be the essential qualities of leadership, though I shall refer to some of them.

### The Real Problem

Lord Moran, President of the Royal College of Physicians, writes in his most interesting and instructive book on the "Anatomy of Courage" that the art of command is the art of dealing with human nature. That I believe to be the guts of the problem. No one can be a real leader nowadays unless he understands and has natural

sympathy with the needs, aspirations and outlook of the people he is called upon to lead, and is able to inspire them with the ideals of service before self, and with the self-discipline which that involves.

It is mainly on this aspect of leadership that I shall speak because I believe it to be the most important one. I think we sometimes make a mistake in discussing leadership only on the level of the Commander-in-Chief, or the boss, or the Board of Directors, instead of through all levels of organisation and command. The Commander-in-Chief is, of course, a very important person in relation to all that concerns leadership. Having been a Commander-in-Chief myself for four and a half years of the war, I obviously could not say less. But he must have at the other end of the chain of command good platoon and section leaders. The Commander-in-Chief may make the best possible plans for winning the battle with plenty of guns and tanks and aircraft supporting the Infantry ; but he will not win it, unless the cutting edge is sharp and truly tempered, unless the platoon and section commanders are leaders of courage, skill and initiative. I believe that the same applies to industry.

I hope you will bear with me, if I talk what to you are platitudes, and if I base much of what I have to say on my experience as a soldier ; though perhaps I need not claim indulgence on the latter score, because so many of the problems of leadership in industry are similar to those we had to tackle in the Army during the war.

I read some time ago a speech Mr. Herbert Morrison made in which he was quoted as saying : "I wish I could feel that we were going into this battle of the balance of payments (between imports and exports) as well trained and with as high morale as we went across to Normandy on D-Day."

That is a striking statement from a man in Mr. Morrison's position, and it seems to me a good peg on which to hang what I have to say about leadership, both in peace and war.

### **Training for D-Day**

Perhaps if I briefly describe a few of the main features in the training of the Army for D-Day, I may be able to indicate some of the ways in which Mr. Morrison's wish could be fulfilled in the battle for the balance of payments, a battle corresponding to the establishment of the bridgehead in Normandy preparatory to the advance to victory.

We began the training of the Army at home for D-Day in 1941, and among the main objects we set out to achieve were :—

- (a) raising morale and discipline to the highest possible level.
- (b) creating confidence through realistic training.
- (c) building up the prestige of the Infantry as the cutting edge of the battle.

To deal very briefly with these objects, it was obviously essential to raise morale after Dunkirk, and equally obvious that it was going to be difficult to maintain morale through what looked like being, and proved to be, a long period of training at home. The two main factors in achieving this were firstly keeping all ranks fully informed of what was expected of them and why, and of the purpose of their training ; and secondly making all training as interesting and realistic as possible.

The response was remarkable, and I consider it to be one of the major lessons of the war. Such training had been applied by Sir John Moore 150 years ago to the famous Light Division in the Peninsular War.

He also applied entirely new standards of intelligent discipline based on the team spirit, a discipline willingly accepted by all ranks and not enforced by fear of punishment. We trained the Army at home on the same lines as those laid down by Sir John Moore.

The effect of the realistic training was clearly proved on D-Day. All the assaulting troops had been shot over in their training and so knew what to expect and were not afraid of the unknown or unnerved by the shock of battle. A high standard of realistic training had given them confidence in themselves and in their weapons.

The prestige of the infantry as the cutting edge of the battle was established mainly through the training provided at the battle schools, which were started after Dunkirk with the object of building up morale and the team spirit in the fighting unit. These schools, particularly the central school at Barnard Castle, did great work in raising morale and fighting efficiency and in developing junior leadership.

Thereby we escaped the terrible infantry casualties of the Kaiser's war, when as Liddell Hart has written "their very symmetry was their cemetery" : whole battalions moving slowly forward in long lines at a rate of 100 yards in three or four minutes, relying entirely on the artillery barrage and making no use of their own weapons to deal with enemy opposition.

There was no scope for flexibility or initiative either in the fire plan or in the handling of the infantry and it was very difficult for commanders to exercise any control or leadership.

It was under these circumstances that our infantry was given the title of P.B.I.—poor bloody infantry—not an encouraging sort of label to have.

But in this last war they were trained to think and act for themselves and with a high standard of junior leadership ; ready at all times to make full use of their own weapons and to fight their own

way forward by means of fire and movement and not relying entirely on the support of artillery and tanks. Thus the infantry ceased to be P.B.I. and became instead the cutting edge of the battle.

### The Battle of the Balance of Payments

Now having given you very briefly some of the objects we set ourselves in training the Army for D-Day, I want to try and relate those objects to what Mr. Herbert Morrison said about going into the battle of the balance of payments (between imports and exports) as well trained and with as high morale as we went across to Normandy. And though, of course, one cannot draw too close a parallel between training an Army for victory in war and training industry for victory in peace, there are, I suggest, some important points of similarity.

First I think we have to realise that this battle of the balance of payments and all that it represents is every bit as tough a proposition as faced us in the summer of 1944. Indeed, in some respects it is tougher because the issues at stake are not as clear to all ranks now as they were during the war, and so it is more difficult to raise morale and create the team spirit.

You have in the Institution of Production Engineers a great asset as regards leadership in that most of your members have risen from the ranks, as it were, to high command, by their own merit, ability and initiative. And so you have first-hand knowledge and experience of what makes for good morale and team work, and the reverse ; and what I have to say on the subject as I knew it in the Army will not be new to you.

I said just now that one of the main factors in raising the morale of the Army at home during the long period of training before D-Day was keeping all ranks down to the private soldier fully informed of what was expected of them and why. This is an essential responsibility of leadership, and one of the best incentives to team work. Men quite rightly want to know how they as individuals fit into the scheme of things ; they want a clear target to aim at ; and, as far as is humanly possible, they want to be free of the anxiety caused by a sense of insecurity and uncertainty.

It is not to be expected that you can have intelligent team work and intelligent discipline (by which I mean a willing co-operation and self sacrifice for the common good) unless all ranks know their place in the team, and are made to feel that they have a worthwhile part to play as members of that team.

### Necessity of Decentralisation

Where you find ignorance down below of what is going on up above, where you get lack of liaison through the chain of command, and failure to decentralise responsibility, there you usually find also

inefficiency, lack of confidence, misunderstanding between commanders and their subordinates, between employers and employees, and lack of interest in the job. And it is in my experience a sure sign of the lack of the right kind of leadership and example from above.

The " infernal perpetuity of imposed authority " (a formidable phrase which I heard used by Colonel Urwick), the attitude of " theirs not to reason why, theirs but to do and die " will not work these days in the Army or in industry. It never has produced the best results, though maybe the leaders who believed in that method thought it did, which goes to prove how out of touch they were with the rank and file. You must have every link of the chain taking a fair share of the weight, and that can only be achieved by a sound system of decentralisation of the powers of leadership and decision, which create the spirit of mutual trust between management and men and encourage individual initiative and pride in a job well done.

I was very concerned about the maintenance of morale in the Middle East Forces after V.J.-Day. Many of the troops had been overseas for four and five years, living in the desert with none of the amenities of civilisation, unless you reckon the wireless as an amenity. They had stuck it out with a wonderfully high morale so long as the war was on ; but now that it was ended, they felt they had had enough and it was time for them to get home and see to their own affairs ; and I fully sympathised with them. But it could not be done in a hurry and they had to wait their turn. A great deal of trouble was taken to explain the situation to all ranks and why it was that the Queen Mary could not be made available to take them home, why we had to continue to maintain strong forces in the Middle East although the world war was ended. And we also through the Army Education Corps developed a remarkable programme of education in civics and vocational training, designed to prepare men for return to civil life, and to help them to realise that they had not wasted the best years of their lives.

Again, as in the case of the battle schools, we got a wonderful response, as you will always get from our people when they know what is expected of them and why, and they trust their leaders. Nelson's famous signal is perhaps the best example of that. It is through this type of education that we shall break down the suspicions and prejudices which handicap us in our battle for the balance of payments, and for the triumph of democracy. Here is great scope for leadership throughout the chain of command from the Board of Directors to the foremen and charge-hands.

### The Value of Discussion

I realise, to some extent at any rate, the difficulties in the way of achieving these results in industry. Where it is applicable, I would like to suggest to you the value of the discussion group method which I have tried out very successfully both in the Army and with groups of people from all walks of life at Ashridge. I also know of two firms who have applied this method with like success. The problem to be discussed is first propounded by a well-qualified speaker ; it is then discussed in groups representing all the interests concerned, the size of each group being limited to twelve ; and finally the groups reassemble and put their group's questions to the speaker.

I have not time to enlarge on this method now, but may I suggest that anyone who is interested should come to Ashridge to see it working. I think you would be surprised to find how the most controversial subjects can be dealt with in this way by a cross section of the community in a spirit of tolerance and with a genuine desire to get at the truth. One firm wrote to me that they had tried this method with considerable doubt as to how it would work. Those attending the conference were skilled and unskilled workers, apprentices, clerical staff, executives and management. It was thought that there would be some hesitancy in an apprentice expressing his views, however much he might be encouraged to do so, if the works director was in his group ; or a machine minder saying what he thought in a group which included the Chairman of the company. But to quote from the letter I received, "our doubts were quite unjustified, everyone was most enthusiastic and most of them extremely vocal. Complaints were continually made that the time allowed for discussion was far too short and that every group could have gone on for hours."

At the risk of seeming to digress, I have referred to this discussion group method because I have found it such an excellent way of breaking down the barriers of ignorance and prejudice and of putting people in the picture. I think it might be included as part of the second object I gave you in our preparation for D-Day, namely, realistic training, as part of the process of getting knowledge passed on from the management to foremen and to those working on the shop floor, and thus establishing mutual confidence between management and men through personal contact.

A very important test of leadership, which I have already touched on, in speaking of the initiative required of platoon and section commanders, is the ability on the part of the higher commander to decentralise authority, and having done so, to let the junior leader get on with the job, and not interfere with his initiative. That, however, pre-supposed ability on the part of the higher commander to spot talent and to choose subordinate leaders whom he can trust

to carry out his policy without his having to butt in, realising that it is only through actual experience in the exercise of responsibility that subordinates can acquire a sense of duty and of service.

### Importance of Initiative

This question of encouraging individual initiative in all walks of life is of special significance these days when the tendency in this country is for so many of the responsibilities of existence to be taken out of the hands of the individual and the community to which he belongs and transferred to State control. The danger is that we shall develop a habit of mind which looks to the State for the solution of all our problems and the provision of all our needs. But that is the way of totalitarianism, and the negation of democracy which, according to the Oxford Dictionary, means government by the people through their elected representatives and not government of the people by their elected representatives.

You probably all know the tag :—

“ Ill fares the land to bureaucrats a prey  
Where forms accumulate and men decay.”

We must not allow that to happen. We must see to it that we preserve our birthright of freedom which for us has always meant the sturdy spirit of independence and full scope for creative initiative, and not the security of Whipsnade from the cradle to the grave.

Admittedly a good deal of State control is necessary in these abnormal times of post-war recovery, but we must watch that it does not degenerate into something dangerously akin to totalitarianism. I suggest that we can do quite a lot to help in this by decentralising authority and encouraging initiative to the fullest possible extent in the concerns for which we are responsible, by educating public opinion and by trying to solve the problems of the community within the community.

We need leaders in all walks of life and at all levels to take a hand in this most worthwhile task of educating the man in the street, the ordinary citizen, to a knowledge of the facts, so that he will be able to discern the truth through the smoke screens of propaganda and misrepresentation which so often befog the real issue.

The only answer we have to propaganda is knowledge of the facts ; and given the facts the ordinary citizen of this country is much more likely to be right than wrong in his judgments. So it is that Disraeli's statement that on the education of the people of this country the fate of this country depends is profoundly true to-day, with a much stronger force and wider meaning in relation to the responsibilities of democracy than Disraeli had in mind. It is our surest safeguard against the disruptive influences which are now threatening the world.

### The Question of Prestige

Another aspect of this responsibility of leadership in seeing that all ranks know what is expected of them, and why, is the question of prestige, to which I referred in speaking of the raising of the status of infantry from P.B.I. to that of the cutting edge of the battle. If a man is to do his job well, he must have some interest in it and a sense of pride and satisfaction in the doing of it, and of loyalty to the organisation to which he belongs.

I appreciate that this aspect of leadership is likely to be more difficult to tackle in industry than it is in the Army, where we are not faced with the danger of divided loyalties and where it is much easier to inculcate the ideals of *esprit de corps* and of service before self.

But in reading Colonel Radcliffe's admirable pamphlet on "Men, Management and Machines," I am struck by the similarity between the methods he suggests for dealing with this problem in industry and those applied in the Army.

In both cases it seems to me that it is largely a matter of forethought, imagination and organisation on the part of the leaders throughout the chain of command, of a sympathetic understanding between the leaders at all levels and those whom they lead : and by understanding I mean knowledge on the one hand and appreciation on the other.

A dull job can be made interesting if a man understands how it fits into the pattern of the whole, if he can be made to realise the part he is playing in the battle for the balance of payments. And just as the agitator thrives on bad administration, so can he be defeated by sound organisation and attention to the details which make for efficiency and well being. In married life, we married people know that it is the little things which count and the same applies to the Army and to industry in regard to loyalty and team work ; that is where forethought and sympathetic understanding come in. It is the duty of all leaders from the Commander-in-Chief to the platoon commander to study and to understand those details which make for efficiency and well being ; for that purpose they must be qualified by practical experience as you are in the Institution of Production Engineers.

We have not yet recovered from the evil effects of the industrial revolution and the *laissez faire* attitude under which the human being was too often regarded as a mere unit in the production machine. It takes time to get over these evil effects and to re-establish the ideal of the dignity of labour and of the individual worker, which results in mutual confidence.

But undoubtedly we are making progress, and a most hopeful proof of that is that we now recognise the problem.

We must, however, be constantly on guard lest the process of

mechanisation and development of big business may kill the human element, which, as I said at the start, is the guts of the problem. I think there is also a danger that as a result of too much control, we may lose something of that spirit of enterprise, initiative and adventure on which the British Empire has been built up.

It would be fatal to our future if we came to lack faith in wide and far-seeing enterprise, as for example in the use of scientific developments, not for immediate gain, but for long term progress. That applies also to all of us at this present time as regards faith in our long term destiny.

I have talked long enough, for it is a well-established fact that very few people, even in a highly intellectual audience such as I have the honour to address, can keep their attention concentrated on what the speaker is saying for as long as thirty minutes ; and fewer still who can remember thirty minutes afterwards what he said, assuming always that what he said was worth remembering.

### **Effect of Example**

But there is one more quality of leadership of which I must speak before I sit down, and that is the vitally important moral one ; the supreme quality which lifts not only the leader but also those whom he leads above themselves, so that they willingly put service and loyalty before self, and in a crisis hang on and fight it out when the odds are against them and when their natural inclination is to let everything go.

No leader can have that power unless he himself sets the example in integrity and self-discipline ; unless he puts the welfare of the team before his own ; unless he lays his own bricks straight, to quote the epitaph to Lord Lugard, the great colonial administrator. That sort of leader does not have to look over his shoulder to see whether his men are following him. He knows they will.

The reason why Napoleon, Hitler, Mussolini and others of that type of leader crashed was because they lacked the moral qualities which are fundamentally the most important element in leadership, the element which can save a situation when on the brink of disaster, and turn defeat into victory. We have seen the proof of that so often in our long history, and not only at the top but at all levels of leadership and among all classes of the community.

Looking back to that long history which we inherit, we have no cause to lack faith in ourselves and our destiny. We have no reason to fear that we have lost the qualities of leadership. We are, however, masters of the art of understatement and self-depreciation, and admittedly that is better than being a " stick ". But we must not carry it so far that we come to believe in our self-depreciation. I prefer to accept the criticism of a Frenchman with whom I was travelling in Morocco and who, when I did something annoyingly

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Britannic said : " All the world is prepared to admit the superiority of the British race, but what we cannot stand is that you take it for granted."

It is the responsibility of leaders in all walks of life to develop a sense of pride in our British heritage and in the British Commonwealth and Empire, which in 1940 saved not only ourselves but the world from disaster.

When we are tempted to overdo the grousing about conditions of life to-day, and to feel faint hearted for the future, let us remember what we have won through in our generation, and what we have achieved, and thank God that we have weathered the storm so well, and are in better heart now than after the Kaiser's war.

Though we must not be conceited to be English (and I use that title in its most generous sense to include Scotsmen, Irishmen and Welshmen throughout the Commonwealth and Empire), and without wishing to detract from all that we owe to our Allies, particularly the United States, as Englishmen we should recall with pride and a tremendous sense of obligation what happened in the summer of 1940.

Surely no one can have experienced that time without feeling a tremendous sense of obligation to Almighty God who wrought the miracle of our recovery and to our comrades who gave their lives in the sure faith that we would carry on and fulfil the purpose for which they fought and died.

That is a challenge which we are in honour bound to take up by making the fullest use of the opportunity their sacrifice has given us. I venture to think that your Institution has great opportunities and I believe that you are making the most of them. There is no better way in which you can redeem the sacrifice of two world wars and give a lead to victory in the battle for peace and progress.

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MAJOR C. B. THORNE, M.C.  
Director and General Secretary.

## RESPONSE

by Major C. B. THORNE, M.C.

*Major Thorne, joined the Institution of Production Engineers as its Director and General Secretary in March, 1945, with a first-class reputation as an authority on British Commonwealth affairs. His utterances over a period of years have proved him to be a man of considerable vision and as a result of his outstanding organising and administrative ability, the Council has been able to embark upon a more ambitious programme of public affairs which has resulted in the Institution obtaining far greater recognition in authoritative circles.*

The toast, "The Institution of Production Engineers," coupled with the name of Major C. B. Thorne, having been honoured, Major Thorne, Director and General Secretary of the Institution, then responded :

Mr. Chairman, Your Worship the Mayor and Lady Mayoress, Ladies and Gentlemen :

I feel greatly honoured at having been called upon to respond to such an outstanding address.

### Outstanding Leaders

During the present armistice—and I say "armistice" because in the second World War whilst we destroyed one form of parasitical growth in Europe, we allowed another form to flourish—it is during this period of uneasy tranquillity that we are apt to forget the greatness of men such as General Paget, and to overlook their outstanding qualities of leadership.

The equipment of modern fighting services is highly technical. The units comprising such forces are numerous, with widely differing roles. Therefore, to co-ordinate the activities of an army of say two million men—to stimulate individual initiative—to inspire confidence and enthusiasm in face of death, and to create an efficient fighting machine—calls for the very highest qualities of leadership.

Britain to-day is going through the greatest economic battle of her long history. She entered the First World War at a time when she could perhaps be described as the industrial leader of the world—but two world wars have increased the pace of industrial development abroad, particularly in the Dominions. The Second World War, however, brought about great political changes which in their turn have affected Britain's economic relationship with the world markets. Competition has become fiercer, thus increasing

the struggle for the retention of markets. I am making no mention of the necessity for foreign exchange with which to purchase food and raw materials. This is already well understood by everybody.

### **Two Vital Factors**

Since the cessation of hostilities there has been an intensive drive to increase productivity—the emphasis being placed always on productivity. I would submit that productivity is merely *one* of the factors with which we must concern ourselves to-day. If this is so, we should ask ourselves, should our endeavour be merely to develop mass production methods, or should we give consideration to two other—in my opinion—most important factors—*quality* and *cost* of production? In bringing forward these two factors I am of the opinion that the character of the people of these islands should be taken more into account when shaping our future economic destiny.

We have been told recently by the Chancellor of the Exchequer, Sir Stafford Cripps, that it is the Government's intention to set up an Anglo-American Council on Productivity. In this respect, I have much pleasure in announcing that the Institution has to-day received a cable from America, in which its Vice-Chairman, Mr. W. C. Puckey, states that the head of the United States Government Productivity Division, who was partly responsible for the formation of the Anglo-American Council, contends that the co-operation of the British Institution of Production Engineers is vital, and suggests that we communicate this opinion to His Majesty's Government.

Whilst I realise that great benefits may be derived from such a body, I am convinced that such a Council should be capable of giving advice not only to this country, but to America, for there is a great deal which Britain can offer. To-day Britain leads the world in shipbuilding—the demand for British linen in America exceeds output—the same remarks go for pottery—and a Rolls Royce car is still in demand despite its price.

### **Expert Knowledge Ignored**

In their attempt to improve production, the Government has convened many Conferences and set up numbers of committees, many of which tend to jostle each other and create a confusion of ideas. I feel that the problem of productivity requires investigation on the highest level, but the methods of investigation should be simplified. Life is becoming too complicated. It is perhaps on account of our inherent national conservatism that Governments persist in looking to the two extremes - employers' organisations on one hand, and organised labour on the other - for advice. In pursuing such a course, Governments frequently disregard the extremely valuable help which may be derived from professional bodies, whose membership is made up exclusively of highly qualified

individuals who in the industrial field owe no allegiance to either extreme but who are concerned primarily with the practical methods to be employed on the shop floor.

On 15th September an excellent Conference was convened under the auspices of the Ministry of Labour and National Service to discuss Joint Consultation, Training within Industry, Works Information, and Personnel Management. These four items on the Agenda can be compared to the instruments in a doctor's bag. What interested me at this Conference was not the instruments, which are common to all doctors, but the absence of any reference to the doctor himself who was going to handle them.

This Conference was followed on 16th September by another Conference, convened at the instigation of the Engineering Advisory Council to the Government, and held under the auspices of the Federation of British Industries to cover Production Efficiency from the angle of the employer. Delegates were handed a pamphlet which asked them to "take another look" at production efficiency. Amongst points for consideration this pamphlet mentioned the organisation of stores and shops, and contained a number of questions such as "Is the best use being made of labour? Is the best use being made of present equipment? Is adequate provision being made for future development?" These points and questions, important as they are, do not in my opinion touch the major factor, that of leadership and management, for in all organisations whether the services, commercial or industrial, every delegate here must admit that the inspiration of good management must always come from the top. It is, therefore, in the Board Room and amongst top management groups that the searchlight should be placed in the first instance. At the same Conference we were told that the Government had asked Industry, through trade associations and professional bodies such as ours, to submit proposals for increasing productive efficiency, and therefore I hope that this Institution will not fail to take a leading part.

It is unfortunate that His Majesty's Government has not seen fit to include representation of the Institution on the National Productivity Committee. The activities of this Institution cover a wide field, including human problems, technical problems, the use of substitutes and the practical application to production of scientific developments. These four factors are covered by the panels of the National Productivity Committee, and I think the delegates at this Convention will agree that the Institution has much to offer in respect of productivity generally.

### **Selection and Training**

The fighting services make an intensive study of the treatment of human problems, which after all are predominant. The Army takes

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into consideration not merely the selection and training of subordinate leaders, but also that of those who are likely to command millions of men. Unfortunately there is no civilian equivalent to this higher training. No one knows better than General Paget that it is not only the tools but the efficiency and fervour with which such tools are handled that make for results. Good leadership can create pride in oneself, pride in one's work, and pride in one's country.

During the late war the public were given ample opportunity through the medium of the Press, wireless and cinema to observe the trend of military events, and therefore they learned to realise that in an armed conflict very much depends on the individuals at the top. We were all able to observe the respective qualities of such men as Eisenhower, Alexander, Montgomery, Mountbatten and many others, and to compare them with some of those who were less able. I strongly recommend delegates attending this convention to read in this connection General Sir Francis de Guingand's book, "Operation Victory", which contains a good illustration of a force handicapped by inferior equipment being able to perform its role in modern battle efficiently, due entirely to first-class leadership. The late General Leclerc joined the 8th Army just prior to the Battle of the Mareth Line. He was in command of a very mixed French force made up of a weird collection of individuals in tattered uniforms, they were short of equipment and what they had was very much out-of-date. Nevertheless, on account of the high standard of leadership which he displayed, coupled with his personal ability to manage, and the contribution of this force as a component of the 8th Army was of the greatest value, and the part that it played in assisting in the break-through of the Mareth Line did much to restore the status of France. This is perhaps one of the best historical examples of the triumph of good management over lack of equipment.

To-day we are confronted with a situation in this country where supplies of steel, housing material with which to build factories, machine tools with which to equip them, are all in short supply, and whilst the overcoming of these difficulties may be regarded as long-term policy, industry must face up to the methods to be employed at once, in order to make the very best of the situation as it is, with the technical disadvantages confronting it.

### The Major Problem

I suggest that it is the improvement of management which can be brought about by inspired leadership which is our major problem at the present time and I feel that this Institution has been extremely wise and progressive in asking General Paget to honour its delegates at this Convention by giving the opening address on this vitally important subject.

Many of those who have not spent a period of their lives in the fighting services are inclined to pass wrong judgment on the qualities of military leaders. For instance, it is often stated that they enjoy the advantages of military discipline, and to a certain extent this criticism is reasonable. On the other hand, the idea that the British soldier can only be driven into a high state of efficiency and enthusiasm through the medium of the "big stick" is entirely incorrect. A Briton is a Briton whether he be a soldier, a farmer, or an industrial worker, and the best cannot be got out of him in this manner. He can only be led by those in whom he has confidence, due to their high standard of moral integrity, their superior knowledge of their job, their energy and understanding and above all their tact.

An Australian general once told his officers : " There are two types of officers—those who have to rely upon their uniforms for status, and those who through sheer personality and ability can lead men while dressed in nothing more glamorous than a sandbag. It is the latter type of officer I require."

General de Guingand, towards the end of his brilliant work, makes the following remarks which should be of particular interest to all of us here :

" Many times during the war I tried to analyse the ingredients of the " big man." The following are the points I consider important :—

He should be able to sit back and avoid getting immersed in details ; he must be a good picker of men ; he should trust those under him and let them get on with their jobs without interference ; he must have the power of clear decision ; he must inspire confidence ; he must not be petty, and he should not be pompous."

As General Paget has already stated, members of this Institution are made up exclusively of men who commenced their careers on the shop floor, and have risen by sheer merit to some of the highest positions in executive control of industry—oratory alone is no qualification for management. Unfortunately, to-day there is far too great a tendency to allow those without any managerial experience whatever to talk their way into positions from which they can mismanage the affairs of millions.

### **Benefits of Good Leadership**

Through its membership the Institution is able to study the methods employed by various industries and compare them. For example, we know of a plant where the production, compared with pre-war figures, has gone up to the exceptionally high level of 650 per cent. The company I have in mind is one which is confronted with increased labour costs, but it has been able to market

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its products, which are of the highest quality, at pre-war prices, and at the same time make a considerable saving in raw material amounting to at least £35,000 a year. The results of this company are largely due to a high standard of leadership on the part of its directors, and this leadership is reflected throughout its managerial tree down to the foremen and charge hands. This is merely one example. Fortunately, there are many others.

As Britain is a highly industrialised nation, which unfortunately possesses limited natural resources, it is upon her industrial efficiency that she must rely for her economic status as a world power. In consequence, the social responsibilities of industry in this country are very considerable, and this fact must be fully appreciated.

We must face one important fact. Through the medium of education, the Press, the wireless, the cinema, and travel, there have been great advances in the general education of the public during the past twenty-five years. It is logical that this improvement in education should create a greater power of discrimination, and therefore I submit that much more care should be exercised in the first instance in the selection of those whom it is intended to train as leaders, for to train without prior selection is in my opinion a waste of time. The changes that have taken place are making an ever-increasing demand for the higher standard of leadership required to-day.

The critical international situation which confronts us at the present time necessitates the strengthening of our defence forces. This will inevitably affect our already serious manpower problem. It is only through the medium of better leadership that we can economise to the fullest extent in the employment of individuals in our production drive.

In conclusion, I would like to thank the General on behalf of the Institution of Production Engineers for honouring us by coming here this evening to deliver what I know you will all agree was an outstanding address. On account of the vital importance of continually endeavouring to improve leadership, I hope that his address will be carefully studied by all those who in their respective spheres are responsible for the shaping of our future destiny.

## THE GUESTS

MR. Norman Rowbotham, C.B.E., Past President of the Institution, proposing the toast, "The Guests", said that on coming there that evening, he had been sympathetically warned that engineers were a hard-headed lot—though the speaker had added that they had very kind hearts. He thought that was probably true. In the toast he included the ladies, and in particular the First Lady of Bournemouth, whom they were all delighted to have with them that evening.

Amongst the guests was that great and gallant soldier, General Sir Bernard Paget, who needed no introduction. Indeed, he had already been introduced and had given them an address which they would long remember. With production engineers the mechanical side—machine tools, planning and processing—had become more or less arithmetical : the one factor in which, perhaps, they were lacking and which could have the greatest influence on the battle of production was leadership—the team spirit. It could have various names, but it was certainly the biggest factor at present in production for export and for the dollar and other currency earnings that had to be achieved. He thanked Sir Bernard for his great address.

Also with them that evening was Sir Patrick Gower, who probably held more secrets in his bosom than many of them would care to have, having been Private Secretary to three Prime Ministers. Sir Godfrey Ince needed no introduction. They were glad to see him in their midst and knew he wished them well. He had been with them at Wolverhampton and his remarks there would not be forgotten by those who had had the privilege of hearing them. Lady Ince was also most welcome.

He hardly liked to refer to the Mayor as a guest in his own city. Councillor Moore had taken the wind out of his sails, however, in saying engineers only came to Bournemouth for fresh air and refreshment. Within a few miles of the Pavilion could be found a company which was doing no mean engineering feat. He referred to the *Ambassador*, one of the finest examples of engineering produced in Great Britain.

Sir Donald Bailey was represented by Brigadier G. R. McMeekan and they were glad also to have with them the Hon. L. O. Russell, Director of the British Institute of Management. The United States was represented by Mr. R. J. Gibbons, U.S. Vice-Consul in Southampton, with his wife, whom they were delighted to have with them. To that great continent with its great-hearted people they owed much thanks. He was sure that the two races would

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go forward together. Britain thought of America as a young country but it seemed that the Consulate at Plymouth, which was being closed for economy's sake, had been opened in the eighteenth century—he believed the earliest U.S Consulate in the country.

Mr. F. H. Reid, Principal of the South East London Technical College, and Mr. J. L. Clegg, Town Clerk of Bournemouth were also present.

From overseas had come Mr. R. H. Davis of Sydney, Mr. Mansergh Shaw of Melbourne, Colonel Warren-Boulton and Mr. R. L. Jebb of Calcutta. Not least, by any means, they had with them Mr. Andrew, Editor of the *Bournemouth Echo*. As one who seldom believed what he read in the Press, he felt sure they would have a very truthful statement in that paper of their deliberations that evening.

Finally, he could not sit down without paying high tribute to Mr. E. W. Hancock in whose mind, he believed, the Convention had been born.

## RESPONSE

by SIR GODFREY INCE, K.C.B., K.B.E.

The toast, "The Guests," having been honoured, Sir Godfrey Ince, K.C.B., K.B.E., Permanent Secretary, Ministry of Labour and National Service, said it was a great privilege to respond to the toast on behalf of the guest of honour, General Sir Bernard Paget, the other distinguished guests, the ladies and himself. This should have been done by the guest of honour, but the organisers, he understood, had felt that it would not be fair to General Paget or the gathering to ask him to speak twice. They were, of course, obviously wrong on both counts. After hearing the brilliant address of their guest of honour, they knew that he could speak with ease on half-a-dozen subjects and they would have been only too delighted to hear him again. As a result of this miscalculation on the part of the organisers, the toast had to be responded to by a lonely civil servant, in the midst of soldiers, industrialists, engineers, representatives of the great United States, of Australia, and of India.

From what General Paget had said he obviously realised the grave risk he and the other guests were running by allowing a bureaucrat to respond to the toast. Sir Bernard would have been far more nervous if in addition to looking up the definition of leadership in his dictionary he had looked up the definition of a bureaucrat. He would have found that it read: "One of a graded series of officials in a centralised form of Government responsible only to his Chief and controlling every detail of public and private life." But he could give General Paget an assurance so far, at any rate, as his own Department was concerned. As one of those hordes of bureaucrats, as they were described, he could say that his Department, in the search for more men than existed, had transformed the tag General Paget had quoted about "Ill fares the land where bureaucrats hold sway." They had as their motto at the moment, "Well fares the land where leadership holds sway, where men accumulate and forms decay."

On the question of leadership, so brilliantly put before them by General Paget, he had one point to make. During the past ten years he had seen a great deal of the Services and of industry, and he was quite convinced that the latter had much to learn from the former—much to learn, that was, in the art of the management of men. If industry could manage men, production would soar to unknown levels.

Replying, as he was, on behalf of a very wide range of people, he was most delighted that the list included the U.S. Vice-Consul. He had recently had the great good fortune to spend two months

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in that wonderful country and hoped Britain would never forget what she owed to the U.S.A. To her they owed their present standard of living and full employment, and without her help they would be in a very sorry plight and unable to get through their present economic difficulties. The Chancellor of the Exchequer had been able, in the past week, to give a most encouraging picture of the economic situation. Great progress had been made towards economic recovery as a result of the very great effort that had been made—and he could assure them that Britain was making a great effort. The words used by the Chancellor of the Exchequer in Ottawa were that Britain had turned the corner. That was a great achievement, but they must not imagine that there were no more corners. They must not think it was a straight road that went downhill. There was still a very great deal of uphill road to be traversed. If Britain continued the efforts now being made and intensified them by means of good leadership, however, she would emerge as a nation secure in economic independence, and would be able to provide an example through leadership—and self-sacrifice—to all the other countries of the world.

He thanked the President and through the President the Institution for their hospitality and for inviting their guests to be present on that great occasion, for it was a great occasion—the first National Convention the Institution had held. He thanked them, finally, for giving their guests such a thoroughly good time.

The Chairman then declared the proceedings closed, expressing the opinion that they augured well for the first National Convention which would, he felt sure, be a great success.

Friday, September 24th.

## PRESIDENTIAL ADDRESS

by Dr. HERBERT SCHOFIELD, C.B.E., B.Sc. (Lond.), A.R.C.Sc. (Lond.), D.I.C., M.I.Struct.E., A.M.I.C.E., A.M.I.E.E., M.I.P.E., F.Inst.P., F.I.I.A.

TOWN HALL, BOURNEMOUTH

### Introduction

Mr. Norman Rowbotham, Past President, said that in joining that august body known as Past Presidents of the Institution, it fell to his pleasurable lot to introduce—if such a procedure were necessary—the reigning President, Dr. Herbert Schofield. Wherever two or three production engineers were gathered together, the name and the presence of Dr. Schofield were always welcome and would always add something to the discussion, for as they all knew, in addition to his manifold academic qualifications—of which the syllabus and programme of the Convention would in some measure inform them—he was a man of much wider scope and much wider experience than all the letters after his name indicated. His interests were far-flung, and one of the means whereby engineers could advance production and help the nation was by broadening their interests and hearing other people's points of view, all of which would be helpful to them in their own particular industries.

The Institution had been exceedingly fortunate in acquiring Dr. Schofield as its President. During his term of office the foundations others had laid and the superstructure being built up on those foundations would undoubtedly be strengthened under his able guidance. There was no doubt whatever that the Institution would go forward every day and every week into a glorious future.

### The President, Dr. Herbert Schofield, said :

In the first instance, I should like to thank you for the honour you have conferred upon me by electing me your President. I do not feel that I can adequately fill a position of such responsibility and, if I may say so, of such eminence, but you have my assurance that I will do my best and that my services, such as they are, are fully at your disposal to use for the benefit, progress and welfare of our Institution.

I begin my address to you this morning with a quotation from the President of the American Society of Tool Engineers, where Mr. Holland in his address enumerated some of the advantages of free enterprise :—

"Mechanisation of industry and mass production has made possible an amazing flow of goods at the same time as work-time is decreasing and pay cheques increasing. Many workers have come to feel that this can go on for ever. They grow continuously more jealous of their share of the goods, but at the same time they are willing to work fewer and fewer hours each week in return.

"There is a tendency to forget that hard work and ingenuity made possible the work-saving machines, and that only hard and constant work will continue to improve them. Certain workers, seeing their share of the goods fail to grow in keeping with their desires, or threaten to diminish, try to perpetuate the flow, or increase their share, by turning to a paternalistic government for protection. They clamour for heavier subsidies on more commodities, for softer unemployment cushions, for socialisation of essential services. These they would substitute for work, never realising that effort and skill are the only things upon which they can reasonably expect a return."

This, of course, is a typical American outlook and I think we can say that it would have been ours a few years ago. Times, however, change and we have to progress under conditions which are not always of our own making.

### New Problems in Administration

Mr. Burns Morton, in his book "The New Foreman," states that nationalisation of basic industries, whilst achieving a political aim of public ownership and control, has created new problems in administration. Whereas formerly many separately owned concerns were in competition one with another on the basis of technical achievement, now knowledge and skill are available to all units of production. The fact that many processes formerly trade secrets are now being shared, has shifted the emphasis of industrial problems in Great Britain from the technical to the managerial side.

We are still further affected by the condition of full employment and a large measure of social security. Whilst few can deny the significance of those achievements from the viewpoint both of the State and the employee, there is no doubt that the economics of Plenty have affected the will to work. The incentives which we knew in the past have gone, and whereas it was common for one man to work against another in possibly not very friendly competition, in the belief that the best man came to the top in the survival of the fittest, we now have to bring executive staff together in close co-ordination. For an enterprising community of British business managers this change from individualism to collectivism represents no small achievement. The foreman can do much to

bring about co-operation in a factory, but we must agree that to secure effective *esprit de corps* on the floor of the workshop we require democratic team-work in higher management.

In an address to the London Section of our Institution a short time ago Mr. W. C. Puckey, M.I.P.E., F.I.I.A. gave an extremely interesting talk on the subject of Overheads and Production Costs, and I commend all of you to read his address, for it is a very practical statement concerning a most important management problem. You would, I think, all agree that overheads have risen over and above the increase in direct labour costs since before the war.

The *Daily Telegraph* in its leading article on "Management" on 26th August, quoted Mr. Puckey in the following words :—

"An excellent approach was made, for example, by one speaker, Mr. Puckey, an industrialist member of the former Hosiery Working Party, who pointed out that management was not simply the function of a board of directors or a general manager, but extended down to the junior supervisors and foremen. He emphasised that if we were to get not merely greater production but more efficient production there should be joint consultation between 'top' managers and the lower ranks of management. Trade Unions and nationalised industries are only beginning to take up the policy of many enlightened firms who send promising workmen on technical courses to fit them for managerial promotion. Not every private in industry can become an industrial field marshal, but in industry as in the Army a good N.C.O. can become a better N.C.O. if he is allowed to learn how operations are conducted on a higher level, and where his own particular job fits in."

Mr. Robert Appleby, speaking at the Fifty-first Oxford Management Conference, said that whilst we should in no way lessen our endeavours to reduce direct labour costs, the time has arrived when we should recognise that the greatest savings in production costs can be made by reduction in overheads. Even before the war there had been insufficient concentration on the problem of expenditure control. Clearly the case for an attack on the overhead problem and for placing the greatest emphasis on this is unanswerable. The benefits would be twofold : first, production cost and hence selling prices would be lowered. Secondly, personnel who are at the present time engaged in indirect productive activities would be free to undertake work of a direct productive nature.

### **The Unsolved Problem**

It is a fact that the great problem of industrial relations has still to be solved. We have made many efforts over the last thirty years to improve conditions in the workshops and the terms of work,

but we really cannot claim much satisfaction as far as the real problem is concerned. It is true there is less glaring misfortune and hardship, but the difficulties are still there.

The problem is really not a physical one, but a spiritual one. Even if we meet the difficulties on the physical side, there are still two other sources where difficulty lies. First, the worker should find some creative satisfaction in doing his job, and secondly he should find satisfaction in belonging to a team. We have to realise that in any modern production there is less opportunity for personal creative effort and the worker is thrown back upon the idea of belonging to something or somebody. You know we once had the old idea that the employer merely bought the labour and skill of the worker and the worker was not particularly interested as to what use was made of it. There is no doubt that this idea diverted the loyalty of the worker towards his Trade Union. On the other hand, we must not forget that Trades Union was not created with the idea of giving satisfaction to the worker. Industry itself must be made to produce that satisfaction.

I see the difficulty into which I am running, that we are trying to use our existing machinery to bring about the existence of the team spirit, the employers on the one hand and the Trades Union on the other, using two bodies which were built up for entirely different purposes, and from my point of view this is never likely to succeed.

### **Employers Must Play Their Part**

I see in a recent speech that the Minister of Labour thought that existing machinery was going to lend itself to produce this different spirit of co-operation, but I doubt very much whether it will. Is it not a fact that progress always springs from the individual and never from the Government? The Government merely picks out things that it thinks can help and uses them as effectively as it can. I think we shall have to look to ourselves, as employers, for action and for the breaking of new ground, and I do not think we can depend very much in this respect on the worker. Surely the advanced employer can build the kind of loyalty that I have been suggesting round his workshop and its spirit, and that will take place in spite of national machinery, but what the Government can do, if it will, is to give encouragement to that type of employer.

I was talking the other day to our own Member of Parliament, who, incidentally, is a member of the Labour Party, and he, I think, would agree with me that if we take the nationalisation of, for example, coal, there is no evidence, as yet, that there are any better relations within the industry, although nationalisation is supposed to have taken away the old bone of contention of undue profits made by absentee directors and financiers.

As far as I can see, nationalisation is simply changing a set of private employers into a set of committees who are even more unapproachable and more remote from the individual than his previous "boss" was inclined to be. Certainly, there was some chance of a private employer interfering, for good or bad, but the difficulty of Committee government is that one can never get an answer of a definite character on any subject. What we now require is a definite lead in a personal way from the employer and when this is done there is a tendency for the "ca'canny" attitude of the workers to disappear. If the employer and his workers can come together as a team and mutually discuss their problems with the feeling that a real interest is taken in the points raised by the workers, I am sure that progress will be made. This, however, calls for first-class management, people in control who are really actively concerned in the work and who know it, preferably from personal experience, and who are really interested in solving the problems which the workers present.

We have in our own Institution only quite recently been discussing this question in our Research Committee meetings and we have come to the conclusion that much research can be very well devoted to what I might call the "human" side of the productive problem. Hitherto almost all our attention has been given to improving the technique of productive machinery—improvement in the design and use of the machine tool—improvement in feeds and speeds and in the kind of cutting oil for different processes of work—but very little time so far has been spent in considering how handling costs could be effectively reduced.

### The Basis of Incentive

The great problem of incentives has yet to be solved. What really is the basis of incentive? In the past the answer would come quite quickly "the size of the pay packet." That, at any rate in this country, is no longer the answer. Our experiences in the mining industry alone have certainly most effectively destroyed that particular answer. The question goes far deeper than merely the amount of money that a certain job will produce. We have to create once again something of the desire to do a good job, to do it satisfactorily and to do it with all the mechanical and human efficiency of which we are capable. We need the practical experience of the business manager, the skill of the sociologist, the advice of the psychologist and the help of the trade unionist. The Government is alive to the importance of this question—hence the most generous assistance it has given to the foundation of the British Institute of Management.

We now have their action in setting up a new Committee on Industrial Productivity, on which I think it is, to say the least of it,

regrettable that an Institution which stands overwhelmingly for production is not directly represented. We should have contributed much to the work of that Committee and I am sorry that the reservoir of experience which is represented by the membership of this Institution has not been tapped in this connection.

Again, we have the very difficult question which Sir Stafford Cripps has brought before the country in his statement regarding the setting up of an Anglo-American Council on productivity. I hope the Chancellor will not think me unduly critical if I say that the way in which that suggestion was put over to this country was not wise. I am one of those who believe that the intentions behind the suggestion were good. I think much could be done by a body which jointly considered our own and American production : we have something to learn from them—they have something to gain from us, but any idea that they are to come here to tell us how best to run our business is quite inexplicable to the British production engineer, and to put the case over in that way showed a lamentable lack of understanding of his mentality.

I speak subject, of course, to challenge which I do not think is likely to be forthcoming, when I say that the British engineer is inferior to none. Let us bear in mind that this country has a long history in this direction and has had its developments in specialist and individual work, and in this phase it is pre-eminent.

### **Mass Production or Individualism**

The idea of mass production is relatively new. It is true that it has been followed and developed considerably more in America than with us. I have seen a good deal of American engineering industry. It is very efficient and very clever ; the job is broken down and analysed ; plans are laid for efficient production and the product is then turned out in vast quantities. This system is good, provided the client is prepared to accept a much more standardised form of life than hitherto we have desired in this country. Maybe it is necessary, particularly in these days of national economy, but there is a good deal to be said for the individual idiosyncrasy, and I think we should treasure some of those attributes which have given us our peculiar enjoyment in the past.

However, returning to my idea regarding the Anglo-American Council : it should be one of co-operation and not of direction : one of interchange of views—not of fatherly advice, particularly when it comes from the child of the father, and I think if the Chancellor could be persuaded to restate his ideas in that form he would not only disarm criticism, but he would probably find a good deal of real desire to co-operate.

On Thursday last Major Thorne and I attended a meeting called by the Federation of British Industries in order to listen to an

address by the Minister of Supply. The meeting was a private one so far as the members were concerned and it was called by the employer members of the Productivity Committee in order that they might state the case to the employers in the engineering industry.

The Productivity Committee had apparently reached the stage when something more definite had to be done in order to increase our production, and rather than see the Government take a hand, they had accepted the responsibility for telling their Trades Union members that this was the job of the employers themselves : each in his own industry to set about remedying defective methods and systems in the stores, in the shops, and in general. Such questions as—is the best use being made of labour ? Of material ? Of present equipment ? For example, are hand methods being used when existing automatic plant could easily be adapted ? We might go on multiplying these questions, but the appeal was—could we get better efficiency with existing materials and existing overall conditions ? There were many contributions to the discussion and naturally it was argued that we were sending abroad capital goods which were needed in our own shops, that we were short of essential materials, particularly steel, which produced serious bottlenecks and so cut down overall efficiency. In general, there was a very good discussion, but I came away with the feeling that the real difficulties had not been mentioned.

I think, myself, that in this country our difficulties are human, rather than mechanical. Our workers are unwilling, for some reason or other, to give an hour's work for an hour's pay. We have simply got to tackle the problem of incentives which stares us in the face from every angle. We have to make our Production Committees in the Works real. They should not be a grumbling society, where complaints can be lodged and possibly dealt with. There should be a place where questions can be put by the Management to the workers, where explanations can be given and the full story told. In some firms this will almost certainly mean a limitation of profits for the employer. It will mean that we shall have to give as well as take and engender once again, if we can, the team spirit of pulling together for the country's sake. No other course, in my opinion, will get us back to prosperity and economic security as a nation. The men must feel that they have real leadership in industry and that the employers are with them, that they are not merely concerned with providing improved technical methods, but that they understand and sympathise with their position, and do not regard the workers as mere operatives engaged to perform a special operation.

### **Training of the Production Engineer**

Before concluding my address, I presume you will expect me

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to say something regarding the training of the Production Engineer. It will not be necessary to elaborate this to any great length.

Most of you know the schemes which I have carried into operation now for nearly thirty years at Loughborough, where in the early days we had tremendous difficulty in persuading people that the training of young engineers on a productive system was the only intelligent way of dealing with the problem. Our slogan, "Engineering Training on Production," is now known world wide and it has justified itself again and again by the records of the people who have been through it.

Our students, as you know, take alternative weeks in the productive shops of the College. They go through the whole of the works processes from the foundry and the pattern shop, through the various engineering shops, to the drawing office.

There are certain alternative paths. Those taking Electrical Engineering can experience switch gear, armature winding and allied electrical processes. Those taking Automobile Engineering can spend some of their time in the Service Station attached to the College. Those taking Power Production and Distribution can have experience in the Generating Shop, and similarly in other departments.

It is true to say that a young man who has qualified for the Loughborough College Diploma in Engineering has a working acquaintance of the problems which concern the engineer in almost all types of production. I would not say that he was a skilled foundryman or fitter or machinist : that would be absurd, but he has practical experience of all these things, and he knows something of the difficulties of the job, which a man merely taking a theoretical B.Sc. course cannot possess.

I have said on many occasions, in selecting staff and making appointments, that I welcome a well qualified man with many degree qualifications, but if it is a choice between that man and one who has had actual shop experience I should invariably choose the latter for a staff member of an engineering college such as our own.

This need for technical education in Production Engineering only became widely recognised at the commencement of the second World War. The Technical Colleges offered courses in Mechanical, Electrical and Civil Engineering, etc., but they were biased toward the field of Design of Mechanical Equipment, and the Universities offered little to satisfy Production Engineering needs. It was the prevailing idea that training for Production Engineering was suitable only for a graduate Mechanical Engineer, and this idea is now completely out of step with modern conditions in the engineering industry. Many of the difficulties experienced in

Production were caused by the lack of properly trained Production Engineers. Production Engineering today can no longer be regarded exclusively as an art. It is now a Science, worthy of a place beside the other engineering sciences. To continue to regard Production Engineering as essentially a post-graduate phase of training is to ignore the needs of modern industry.

Today our need is as great as ever—if not greater.

A few years ago, in conjunction with Dr. Fisher and others, I was called upon to advise the New South Wales Government in the appointment of a lecturer in Production Engineering. I am happy to say that the person we recommended was appointed, and that he is doing excellent work in Australia. I read some little time ago a paper which he gave on "The Training for Production Engineers." In this he said :

"Stability in the national economy depends in large measure upon there being an adequate supply of properly trained Production Engineers available for industry. Faced with an era of shorter hours of work and higher wages, our greatest hope in combating the general trend of rising costs is to develop greater and still greater efficiency in production. Perhaps the most important production problem which we have today is the production of first-rate Production Engineers who will contribute in due measure to economic prosperity and higher standards of living."

### The Institution's Part

Training for Production Engineering must, therefore, be a matter for high priority in the affairs of any progressive nation, and I think this Institution can fairly claim to be playing its part. We have, during the past year, appointed as our Education Officer Mr. T. B. Worth, and any who have had contact with him during the past few months will have realised what an excellent man he is for the task. He had the right kind of training, he is full of enthusiasm and his relations with the Colleges have been most happy.

The immediate task in hand is to extend our scheme of National Certificates. These are growing in popularity and it is necessary that the Technical Colleges of the country should be made fully aware of the opportunity which this scheme offers for the adequate training of our young production engineers.

We have for some time been working on our schemes and syllabuses for the Associate Membership Examination which I, for one, would like to see take its place side by side with that of our sister Institutions in being recognised as a graduate qualification.

From all these points you will see that the Institution is building wisely and firmly on a good foundation and I see no reason why it should not take its place equally with the other great engineering

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Institutions of the country, having gained full recognition that in these days a Production Engineer, properly trained, is as indispensable to industry as the good designer.

## WELCOME TO U.S. VICE-CONSUL, SOUTHAMPTON

Dr. Schofield, in introducing Mr. R. J. Gibbons, U.S. Vice-Consul in Southampton, said he had much pleasure in welcoming him to the Convention, as he was attending at the request of the United States Embassy in London. Dr. Schofield was pleased also to mention that the United States Government was so interested in the Convention that it had asked for five copies of the full proceedings to be made available to the Embassy in order that they might be despatched to the Government in Washington.

Mr. Gibbons said he must admit, at the outset, that he knew little or nothing about the profession of production engineering. However, the profession he followed himself—that of a Foreign Service Officer of the United States of America—contained some of the basic fundamentals which production engineers were obliged to learn and follow in their own profession. He referred to the assistance he was able to give, in some small part, in the building of friendship, the promotion of goodwill, and the development of a lasting peace throughout the world. That, in the circumstances at present existing, was no easy job.

He was glad to be amongst Production Engineers, making their acquaintance, and he hoped, as time went on, to be able to meet many of them again, in Bournemouth, Southampton, or throughout the rest of England. He and his wife had only been in England a short two months, having come from Siam, their last port. It was their first visit to England, and they were very glad to have the opportunity of being transferred here. It was also their first visit to this hemisphere and was therefore something entirely new to them.

He wished, in conclusion, to thank the most gracious President of the Institution, the Convention Committee, and all the members for offering him the opportunity of coming to Bournemouth and hearing what they had to say, whether by way of criticism or of a constructive nature, regarding their own problems in Britain and throughout the rest of the world.

## MESSAGES CONVEYED BY COMMONWEALTH DELEGATES

The President said he had great pleasure in calling upon Col. Warren-Boulton, Mr. R. H. Davis and Mr. Mansergh Shaw to deliver messages from Calcutta, Sydney and Melbourne, but before doing so he would ask the Director and General Secretary to read the following letter from the Australian Sub-Council :—

"The President and Members of the Australian Sub-Council have requested that you convey to the Convention their very best wishes for a successful venture, and their hearty congratulations on taking such an important step forward.

In the field of national leadership, it is felt that the splendid syllabus and discussions should very ably cover the subject of the place of Production Engineering in the national economy.

In these days when so much is heard of "produce or perish," such a gathering should prove a national asset.

We here, in Australia, will look forward with considerable interest to receiving the reports of the Convention.

Again wishing you every success.

C. Pullen,  
*Honorary Secretary,*  
*Australian Sub-Council."*

Colonel C. Warren-Boulton (Calcutta) said that he was speaking on behalf of the President and of the Calcutta Section of the Institution which, as some of them knew, was but a baby.

First, he wanted to express India's great thanks to the Past President of the Institution, Mr. J. D. Scaife. It was through Mr. Scaife that they had got together in Calcutta and had inaugurated a Section there. With India's thanks to Mr. Scaife, he wanted also to couple thanks to the Director and General Secretary of the Institution, Major C. B. Thorne.

If there was one suggestion his Section would like to make—and he knew he would have the backing also of the Australians—it was that those coming from so great a distance would like these conventions to last a good deal longer. Two days were barely sufficient even to get to know one another, let alone take in the inspiring addresses they had heard, and certainly not long enough to get together in conference, as they would have liked to have done.

He would like to make one point. He had spent thirty-seven years in India, and those who had been there longest knew least. He did know a little of India, however, especially the engineering side, and he felt that India, in which he included Pakistan, would

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remain within the Empire. While India and Pakistan (which was divided from India only by a line) had shown that they had had quite enough of British politicians, they were demanding more and more production engineers. Above all, to industrialise that great country of four hundred million inhabitants India must have—and knew she must have—the Institution of Production Engineers and the men who came from the Institution.

Finally, he would like to thank the Convention for the friendly reception they had given him.

Mr. R. H. Davis said he had the honour and pleasure of reading to the Convention the following message from the President of the Sydney Section :—

“ To the Members of the Institution of Production Engineers, England :

“ On behalf of the Members of the Sydney Section of the Institution of Production Engineers, I send to you and to all those at the Convention our hearty greetings and best wishes for a successful meeting. Whilst many of our members in New South Wales would like to be with you, distance does not permit our presence. Nevertheless, we are with you in spirit and look forward to learning of the good work done through our representatives who are fortunate enough to be attending the Convention.

Eric L. Olsen,  
Section President.”

Mr. Davis said he would like to add his own good wishes and he felt sure the result of the Convention would be of inestimable value to the Institution, to industry and above all to the brave little country of Britain.

Mr. Mansergh Shaw said he had been asked by the President of his Section in Melbourne, Australia, to convey to the assembly the congratulations of the Melbourne Section on the Institution's First National Convention. The President of the Melbourne Section said that in Victoria the potentialities for the application of the skill of production engineers had never been greater. In all probability Great Britain's problems would in many ways be reproduced there on a smaller scale, and the addresses at the Convention would be of no less interest to Australians than they were to engineers in the United Kingdom. He trusted that the Convention would succeed in all its objectives and sent to it the best wishes of Australia.

The President of the Melbourne Section had also sent Mr. Shaw a personal message to the effect that although the proceedings would be public and a record would be available in due course, it was satisfactory that a direct representative of the Melbourne Committee

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was present to report on the personal aspects of the Convention and thus bring that Committee into even closer touch with the proceedings. That was a very important point. As Mr. Davis had said, distance prevented members in Australia from attending the Convention. But having listened to two very challenging addresses—by General Paget and Dr. Schofield—he sincerely hoped that at each National Convention there would always be present some representatives from the overseas sections to take back to their own Sections their personal notes of the Conventions. And incidentally why "national"? Americans were present and a few from "down under," and they might possibly call it international.

## EDUCATIONAL DEVELOPMENTS IN THE INSTITUTION

Report by F. H. PERKINS, B.Sc., M.I.Mech.E., M.I.P.E.,  
Chairman of the Education Committee.

The President called upon Mr. F. H. Perkins, Chairman of the Education Committee, to give his Report on Educational Developments in the Institution.

Mr. Perkins said :

One of the most important factors that brought together many of the original members of this Institution, men who were already in many cases corporate members of the older Engineering Societies, was the common desire to influence the training and development of younger men destined to become production executives.

This Institution has always recognised that providing there existed a common denominator of sound practical training there were many and various ways by which men might enter the profession of Production Engineering. Universities would thus provide an important channel of approach in which the necessary acquisition of practical experience comes for the most part following the termination of the University courses.

It is our considered opinion that a great deal more can be done to strengthen the approach to Production Engineering through the University channel and we are greatly encouraged by the establishment of the Lucas Chair of Production Engineering at Birmingham University. We extend to Professor Matthew, a member of our own Institution, present with us today, our whole-hearted support in his pioneer work at Birmingham.

Much has been said during the Convention on the subject of government controls and their influence on industry, but it is only right that due recognition should be given to the introduction of the Technical State Scholarships which represents a significant development. It is a disappointment that in the first year of these awards only about half the number available were granted and industry, no doubt, can do much to see that our young men developing with great promise in the environment of our own workshops with collateral Technical College education have the opportunity of benefiting by a University course.

In regard to all these matters affecting University and Technical College education, considerable attention has been drawn to the speech by Sir Henry Tizard at the British Association meeting this year. The implications of his speech, in so far as it has a bearing

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upon the education and training of the Production Engineer, merits careful consideration upon the part of this Institution's Education Committee.

The Technical Colleges have always been recognised as outstanding partners in this work, more particularly by reason of the nature of their facilities which enable those already employed in industry to pursue concurrently courses in Production Engineering. It must be recognised, therefore, that in these and other ways substantial responsibility must always rest upon the shoulders of industry in the collateral provision of sound and appropriate practical training.

In a short review of the work of this Institution in relation to the above matters, it is as well to record one or two of the more important ways in which it has influenced and contributed to the general trend of development in this direction, and particular reference will be made to the courses provided in Technical Colleges through which so many of our younger members seek their first entry into the Institution.

One of the most effective ways by which any institution such as our own can influence a situation such as this, is by means of the education and training requirements laid down in its own qualifications for membership. In this respect the graduation examination, introduced in 1931, had a far reaching influence and for many years this examination represented the only nationally recognised examination qualification in Production Engineering. The syllabus for this examination represented a blend of technological and management studies that has today become so emphasised as the necessary pre-requisite to an engineering career. What is more, it indicated the way in which production subjects could also be placed on a comparable footing with the other older and more established subjects in the physical and chemical sciences for the development of a scientific and analytical approach.

The influence of this examination during the ensuing years could be seen in the introduction of such subjects in a large variety of educational courses in our Technical Colleges. It is also of interest to note that in the intervening period the junior membership of our Institution rose to over two thousand, of which nearly twelve hundred are graduates who have entered either by way of this examination or by recognised exemption through the normal courses in these subjects organised by the Education Authorities.

The growing influence of this Institution in relation to the training of the Production Engineer materially contributed in 1942 to joint action by the Ministry of Education, the Institution of Mechanical Engineers and our own Institution in the establishment of the Higher National Certificate Course in Production Engineering. This was a vital development and much credit redounds to

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those in this Institution who pioneered this major step forward. Twenty-seven of the 120 Technical Colleges in this country are now operating recognised courses under the administration of this scheme and the number of students following these courses is on a steady increase. During the past six years the original scheme, as developed by the Joint Committee has come under expert examination and test and it is the general consensus of opinion that the scheme as initially designed has now become substantially accepted throughout the country.

It was not to be expected that any rapid development of this scheme was immediately possible, more particularly as its introduction carried with it certain important requirements both in regard to the qualification of teachers capable of taking these subjects and also in the necessary provision of laboratory equipment. Considerable help has been given by members of this Institution as part-time teachers in the technical colleges, and educational authorities have done much to make up the serious deficiencies in the necessary laboratory equipment. Solid and substantial progress can be recorded and particular reference should be made to the establishment of a number of well equipped metrology laboratories in Technical Colleges, many of which have received the recognition of the National Physical Laboratory.

It is, however, necessary that we should keep this development, so satisfactory in many respects, in proper perspective ; and it must be realised that the stage has been reached when a full measure of responsibility rests again on the shoulders of industry in ensuring that the utmost advantage is taken of the provisions now available. Numbers attending these courses, although on a steady increase, are still small and unless much more is done first of all in reinforcing the teaching strength in these subjects and also by influencing our young people employed in industry to pursue these courses, the danger of a serious setback may arise.

Foreseeing the need to redouble our efforts in this work, further steps have recently been taken which we feel must have a very beneficial influence on our work.

First and foremost is the appointment by the Institution of an Education Officer, and we have indeed been fortunate in securing the services of Mr. T. B. Worth. Reference to this appointment has already been made in our President's address to the Convention. The other major step forward has been the decision to introduce, as a logical development of our graduateship examination, a full examination scheme for Associate Membership qualification. The sub-committee, comprising members of the Education and Membership Committees under the Chairmanship of Mr. Edwards,

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was assigned the task of preparing the regulations and syllabus governing this examination. These recommendations were approved by the Council in July this year and will come into force in 1950.

The new examination is divided into three parts ; the first two parts comprise the fundamental science required and lead into a range of technological subjects from which selective combinations can be made to meet the requirements of various industries. Successful completion of Parts 1 and 2 will now replace the previous graduateship qualification, while Part 3 is concerned with managerial subjects, having a particular reference to the requirements of Production Engineering.

In the development of this new examination structure, full regard has been paid to the existing Higher National Certificate courses in Production Engineering and also to the recommendations of the Urwick Report in Management Training. It is our opinion that the close relationship of the Institution's new examination requirements with the recent developments in the provision of courses in Technical Colleges will not only safeguard the status of the membership of our Institution, but should also increase the provision of facilities that will enable and encourage good men to seek admission to our Institution.

In this short report an attempt has been made to indicate that this Institution particularly, through the medium of its Education Committee, has not only shown itself conscious of its responsibility in keeping abreast of educational development, but is, in fact, still giving a lead to industry and educational institutions in conformity with the ideals laid down by those who came together in its early days, intent on influencing the training and development of younger men destined to become Production Engineers.

## REPORT ON THE HAZLETON MEMORIAL LIBRARY

By THE DIRECTOR and GENERAL SECRETARY.

The President said it was unfortunate that Lord Sempill, Chairman of the Hazleton Memorial Library Committee, due to his absence abroad, was unable to present the Report on the Hazleton Memorial Library. He would, therefore, call upon Major Thorne, the Director and General Secretary of the Institution to submit it.

Major Thorne said he felt sure everyone would agree that they owed a very great debt to their first General Secretary, the late Richard Hazleton. No one who had met him could help being impressed by his outstanding integrity, personality and energy. It was important that the Institution of Production Engineers which had grown to such an extent and which owed so much to its first General Secretary should do its utmost to perpetuate his memory. In view of this the Council had been extremely wise in proposing the formation of a Memorial Library.

The result of the appeal—although reasonable—fell short of requirements. This was due partly to the disorganisation of the office through the loss of records as a result of enemy action, and to many other difficulties which had fortunately now been overcome. The target set by the Committee was £4,000 with which to equip a really first-class library and information centre at the reconstructed premises at No. 36 Portman Square. That was not a large sum compared with the importance of the undertaking. The Library had physically to be established, equipped, staffed and provided with proper records. It was essential that every production engineer should have access to up-to-date developments in production engineering technique gathered from all parts of the world and should have at his disposal a first-class library and information service. He hoped, therefore, that when the delegates returned to their various Sections, they would stimulate interest in the appeal which would be made to them during the forthcoming winter session. The total sum of money in hand at present was £800 as against the target of £4,000. In addition the Institution was in possession of two hundred and sixty up-to-date works on production engineering which had been presented by its members.

Lord Sempill had stressed the importance of this venture and had expressed the hope that the appeal to be made during the forthcoming winter would receive every possible support.

## BRITAIN'S INDUSTRIAL PROBLEMS

by E. W. HANCOCK, M.B.E., M.I.P.E.

*Mr. Hancock, is well known in the automobile and allied industries. He recently joined the Board of the Humber Co., Ltd., as General Manager, having previously spent six years as Works General Manager with Rubery, Owen & Co., Ltd., Darlaston. During his long membership Mr. Hancock has done excellent work for the Institution, and is a Past President of both the Coventry and Wolverhampton Sections. He now serves on Council as a Vice-President.*

In introducing the speaker, the President said they now came to one of the highlights of the Convention—an address on Britain's Industrial Problems. Surely no subject at the present time could possibly be more important to a group such as that present. They had thought of having Sir Ernest Fisk to talk to them, but he had suddenly been called out of the country and could not be with them. In his place they had Mr. Hancock who was well known to them all. The subject of Britain's Industrial Problems could not be in safer hands.

Mr. Hancock, opening his address, said :

How do we stand in relation to other nations ? Have we an even chance in the fight for existence ? A nation is but a collection of human beings, and I submit that our human material is at least equal to others and our standard of intelligence and education, by comparison, is of a very high order.

If the human race is to exist, which we must assume, then I feel confident that the British race has more than an even chance, if we take Nature's warning that only the "fit" will survive.

A nation capable of our industrial achievements in the last war is surely capable of holding its rightful position in industrial world affairs in times of peace.

*The Times* record of British war production should be read by those who are in any doubt of our capabilities. The Minister of Production at that time, in the War Record, states as follows :

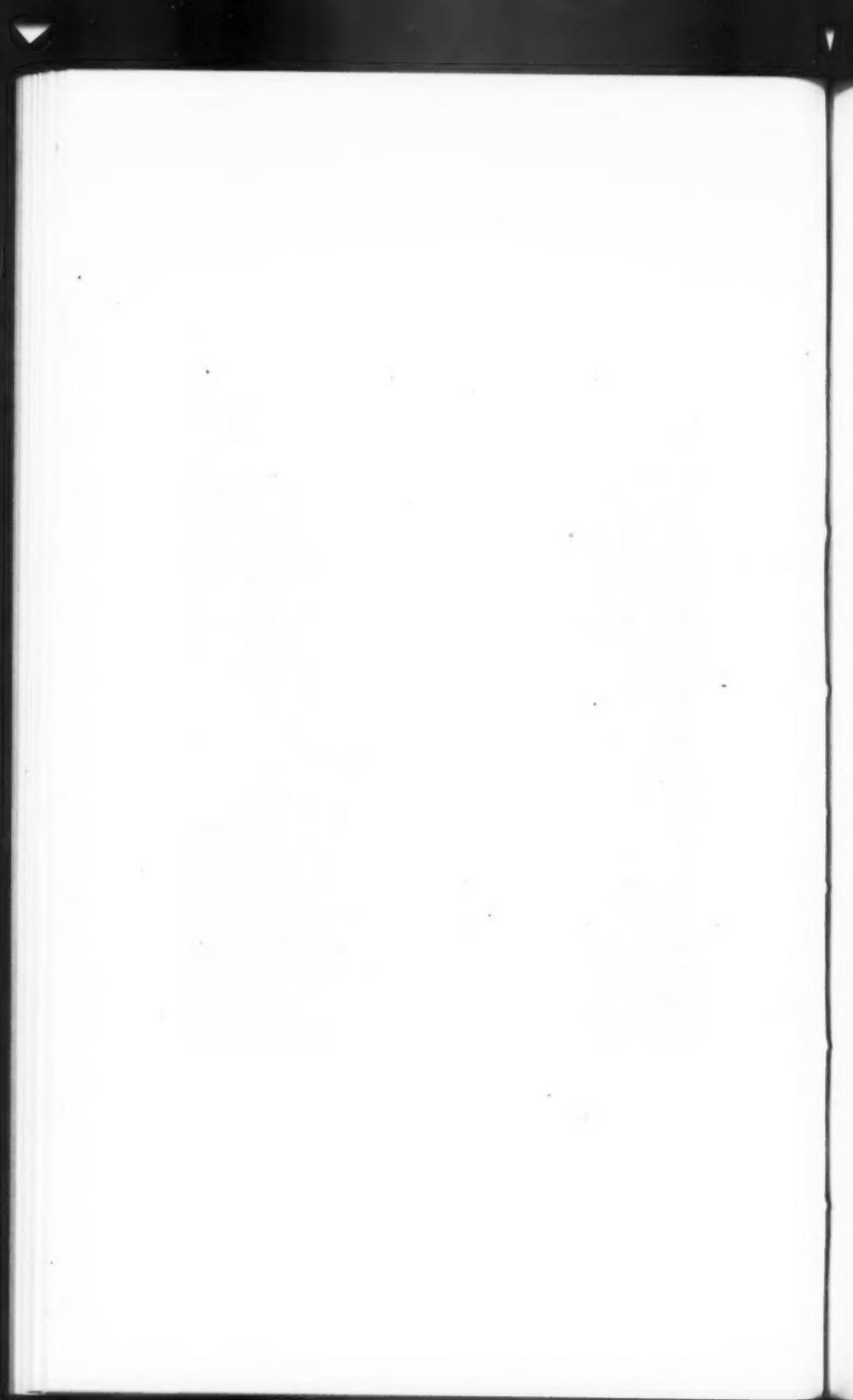
"Victory in the War 1939-1945 was won, not only on the battlefield, on the sea, and in the air, but in the workshops and factories of the Allied Nations."

It is not generally known that we, in this small island, produced 70 per cent. of all munitions used by the British Empire Forces ;



**MR. E. W. HANCOCK, M.B.E., M.I.P.E.**

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a further 10 per cent. was produced by the remainder of the British Empire, and the balance of only approximately 20 per cent. came from the U.S.A.

Regarding the spirit of all concerned in the workshops in heavily bombed areas, such as Coventry, I can give personal evidence to show that this spirit was of an order worthy of the highest praise, and an inspiration to the whole world as to the heights of unselfish loyalty that can be reached by a race of human beings.

### **The Younger Generation**

What is wrong with the present generation, if anything? Who dares to criticise the youth of this country? Let them read the full story of the Battle of Britain and hundreds of other exploits successfully and courageously undertaken by well-trained youth. Let the present-day critics of youth visit the Technical Colleges throughout this land on Prizegiving days and appraise the high technical standard of hundreds upon hundreds of young men and women.

How wise we were to defer enrolment in the Services of our rising young technicians, so that they might continue their studies and reach a qualifying standard of knowledge. We have, in regard to our coming generation of technicians, a good lead on many other nations.

Does anybody dispute that our basic human material is beyond our ability to shape and fashion, and so put the lie to any suggestion of decadence? A nation is only as good as its peoples, and no system or theories can help unless they are based upon simple laws of nature, as after all, we are but Nature's creatures. All raw materials are provided free, and the brains and brawn of human beings are the only media for converting these free gifts into goods to satisfy the needs of human life, which, unlike the birds and beasts, needs more than food. Do we say that we are not fit to undertake the natural tasks of life?

Advice is only good if it is satisfactorily applied. I say quite definitely that we are capable of *being made* fit, and this, to my mind, is the main problem, not only of Industry as it stands today, but more particularly those outside Industry, and here I refer to the "lookers-on," the "critics," and, very especially, the "advisers."

### **Need for More Action**

I believe that the first problem to be overcome is to stop talking ourselves into the belief that we are no good. We must stop talking and start working. When one surveys all the Committees, Conferences, Meetings, and the paperwork that accumulates therefrom, it is a matter that should give us all grave concern. A 168-hour week is not long enough even to read the advice that is pouring out

to Industry telling it what it should do : all this, apart from the tens of thousands of man and woman hours going into the compilation of all this advice. *Don't forget the referee ! ! !* If we are not careful, we in Industry will be like a professional football match with 22 players really striving hard to achieve their objective on the field, and 50,000 people shouting at them.

I speak here as a professional man, one of the industrial middle-class "foster parents," trying, in parallel with all my contemporaries, to apply hard-earned knowledge and experience to my daily task.

Take a cross-section of the hours that such professional men spend outside what may be termed "normal hours" (abnormal to present-day standards) and see the additional hours being given to the study of the applied sciences. Industry is fully equipped with such men, and I submit, therefore, that the first national problem to overcome is to "cut the cackle and get on with it." Conscientious work by all is our greatest national need, and I submit as a good definition of what I mean by conscientious work the following :

Exertion for accomplishing some end, actuated by a strict regard for the sense of right and wrong. Work is "live" capital, continuing to "fill the larder" which keeps a race healthy and internationally efficient.

The next serious national problem affecting Industry is the very high percentage of non-productives in this country. No factory and I submit, no nation could be efficiently run with such an unbalanced set-up. Surely a stocktaking of the nation's creative work would show large untapped sources of opportunity and wealth waiting for our peoples. Such wastages of valuable human material can be nothing else but a sign of bad management, and need very early attention.

### **The Meaning of Production Efficiency**

Coming more directly to the specific subject under review and dealing with that far too small section referred to as "Industry," what are its main problems? Efficiency of a unit cannot be assessed at a lunch-table or at a mass conference, but only on the individual shop floor. Much is said on the question of *Production Efficiency*, but what does this mean? Is there a yardstick to this phrase so frequently used by our advisers? Basically I believe a good guide to this is "the output per square foot of factory space per pound of wages paid per hour," taking comparison of standards of output in like industries.

What is the greatest stimulant to *Production Efficiency*? In my opinion this must commence with a good "head" of all basic materials, so that "pressure" of an understandable type can be applied right through all the stages of industry to the intermediate

and finishing industries. There may be limited material resources in this island, but what about the British Empire and its resources? Who in Industry would be so foolish as to expect workpeople to work themselves out of a job by consuming materials at a greater rate than the supply? How can the "tempo" of Industry be speeded up unless the "tempo" starts at the "feeding" end? These are very simple observations, but nevertheless they are true, and much more focus is necessary to see that first things come first, both nationally and industrially.

I submit that there is another serious industrial problem, namely in dealing with basic supplies, where equal, if not greater, emphasis should be given to balancing-up varieties of materials as is given to total tonnage. If our goods are to reach the highest value for export purposes, then this, in turn, must lead to complicated assemblies requiring every variety of materials and supplies *in balance*. Today, far too many semi-finished assemblies are waiting for the balancing items, thus freezing valuable materials and labour; also, if certain specific supplies were released at a greater rate, then total export values could be increased.

### The Broader View of Management

Much is said on the question of Management, and the inference, if not the actual quotation, refers to Management in Industry, but surely this subject of Management should be applied in its widest sense and should refer equally to Management of the nation's affairs as well as industrial affairs. Management in Industry has improved and is improving rapidly, and one of the best signs of this is to notice that most modern Boards of Directors are becoming more and more executive. Men who, in their several professional spheres, have come up the hard way over many years are now holding positions on boards and are having a say in the direction of Industry. Also, there is a healthy sign of industrial democracy, but there are still, and *always will be*, many complex problems associated with human and industrial relations. Because, however, modern Management is now more able to give a name to these various human problems, there is no reason to believe that these problems are any greater than ever they were. What is necessary, however, is to raise the general standard of education in order that there is a better general understanding of these problems, in an endeavour to find the best type of compromise.

It is felt that there is no complete cure to the question of human relationships, but those of us who have been dealing with such matters for many, many years know there is a way of dealing with these problems. If we, as a nation, are to be internationally competitive, then it is a matter of absolute necessity that our products should be continually reviewed and revised and re-

designed in order that we can take full advantage of the basic and scientific discoveries being made. Competition is caused by the industrialisation of other countries, including our Dominions. To this end, therefore, Industry in this country has, of necessity, to remain flexible, in order to put into production new competitive units. In order to do this, however, it is equally necessary to revise and reorganise our factories and to install all types and kinds of modern production equipment, plant and machinery. Industry cannot yet quite understand why we are exporting some of the finest and most ingenious plant and machinery ever devised, to other countries.

It seems that we are exporting the "goose that lays the golden eggs," where surely we should give our attention to exporting the "golden eggs" and retaining the "goose" in this country.

### Petty Restrictions

This problem of industrial development from an equipment point of view is also aggravated by the many petty restrictive atmospheres in which Industry has to work in order to develop its buildings, roads, transports, etc.

The quality of our products, their cost, and the rate at which we can produce them remain vital factors, and here the emphasis must be laid on cost. Also, there is an atmosphere of uncertainty as to what is going to happen in certain industries.

It is considered bad management to be continually changing policies, and it seems unwise at this stage that there should be any uncertainty as to the future management of industry. It is felt that much greater energy would be expended in the national interests if our professional industrialists were left alone to develop along well-proved lines.

The work of the Institution of Production Engineers is helping very considerably to develop technical democracy in industry. We, as a nation, have been rather inclined to keep within our professional water-tight compartments, and, whilst individually we can hold our own with any other individual, I consider that we still have to develop our ideas and practices of team-work. New projects and new schemes should be discussed very early with all competent factions, so that all the various technical units in industry can feel that they are a part of the project and can make their suggestions and criticisms at a time when they can be incorporated. Not enough emphasis is given to the calendar time factor in industry, and this is particularly so in reference to the various Government Departments with which industry has to work and be controlled. Much valuable time could be saved if more local authority could be given so that quick decisions could be made. It appears that with all our very

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costly regional machinery, it is still necessary to refer to headquarters for a decision. I am not necessarily advocating regional machinery, as I do not feel that this is the solution, but if we must have regional machinery, then let it be really effective and waste the least amount of calendar time and man hours in reaching decisions.

### Ineffective Slogans

Much is also being said about the workpeople of this country, but to my mind, the posters which are displayed throughout this land are ineffective and, in some cases, are an insult to our intelligence. Who would hoist a flag on a factory smoke stack (let alone the Union Jack), for this to be covered with smoke? Agreed—let us hoist the Union Jack as high as possible in our factories, but keep it out of the smoke.

In my view, having had the opportunity of studying his counterpart in many countries, the British working man is second to none, and if we wish to raise his morale, then we must see that his purpose in industry is much more clearly defined. I believe that the best definition of morale is "the attitude of a group to its purpose." This purpose, so far as the national need for exports is concerned, has been clearly defined, but we in industry must continue with the important work of defining the purpose, even of the smallest group, so that they all feel that they are a part of the industrial life and that they belong to the scheme of things. I feel that there is much work that can be done along these lines in a practical way within industry itself, and not by means of posters, notices, mass meetings, etc. Let it be part of our daily life in a genuine and understood scheme of education.

The future of this nation's well-being depends on how we work. If we work from our hearts because we *want* to work, then all is well. If we work from our stomachs because we are *driven* to work in order to live, then we are no better than dumb (very dumb) animals. Work does not mean just digging the same hole harder and faster or whipping and flogging the same old machines and methods. It means firstly conscientious and hard work by all of us because we like it. Secondly, it means more intelligent and scientific working so that a full measure of the good things in life are available for those who have earned and worked for them.

Such progress must be made if we are to keep internationally competitive and so maintain the financial structure which relies upon exchange of imports for exports. Work is a Briton's birth-right, and we as a nation must not sell this birthright for a "mess of false security pottage."

If, in individual factories, there is a bottleneck, there is very rarely any difficulty in getting the men concerned to work overtime.

Are we satisfied that in our national bottlenecks we are working overtime? Are we satisfied that we have gone far enough in stressing the importance of output per hour, as against the customary importance of "price per piece"? Do we feel that the piece-work system is in itself not jeopardising our understanding of the industrial purpose?

### Man Hours as Nation's Wealth

I have purposely avoided, in this address, any reference to statistics, as these are all available to those who need them, but I do believe that a nation's wealth is not assessed by tons of gold buried in the vaults of her banks, but in the maximum number of creative hours that are put in each day, by each of us and this—and this alone—will establish our fitness as a nation to hold our rightful position.

Much reference is made to the word "frustration" by our industrial psychologists and psychiatrists, but let it be known that this does not only apply to competent workpeople, but also to competent managements. I hasten to say that a good deal of our mental problems today are purely imaginary and are insidious in that far too much is being talked about this subject and not enough is being done in creative work.

I would set up as a good example, the work of the present-day British housewife, who has no limits on her hours of work, who sets an example in acquiring materials in balanced sets, and withal has very little glory of the public-speaking type. Nevertheless, I quote this example as indicative of the question of morale, as the housewife's purpose is obvious and is understood by her, it being closely associated with Nature in the "cleaning of the nest" and the provision of food. If we, in industry, can break down our human problems in the same way, so that each individual is aware of his or her purpose, then there will be a better understanding all round.

I submit that it is not the problem of labour to manage business, but it is the duty of management to improve management.

Much progress has been made in all the sciences in the last 25 years, both in regard to the product, the methods, and in the science of management, but we have before us both a short-term and a long-term policy, if we are going to bridge the immediate gap on the one hand and build an everlasting and substantial bridge in the future.

I believe at all times the present is much more important than the future, because, after all, the future does depend on the present, and we must all, in our several tasks, obtain the necessary balance of happiness and satisfaction, so that we can retain one of our greatest assets, namely a sense of humour.

### Nine Points to Consider

Summing up, therefore, I would submit the following pointers for general consideration and discussion :

- (1) Stop talking and let industry get on with it.
- (2) Watch our non-productives, both inside and outside industry.
- (3) Adopt a more democratic approach to our everyday problems with industry.
- (4) Let first things come first, and by means of overtime, raise a sufficiently large "head" of material in balance, and so keep the "pressure" on industry in a way that it understands.
- (5) Improve our management by accelerating proven good practice and apply this throughout industry, both in large and small factories.
- (6) Don't nag the working man, but give him plenty of material and modern plant (and equipment to work with) and he and management will do the rest.
- (7) Stop exporting the very tools and plant we require ; improve production per man hour.
- (8) Give industry more freedom, so that its ingenuity need not be given to beating the controls, but in beating its international competitors.
- (9) Above all, help industry to hold its rightful place in world affairs by giving due credit to its achievements over the past 25 years, and encouragement to develop along well-proven lines.

The President, in thanking Mr. Hancock for his address, said that it had given them a good many points to think over. There would be ample opportunity for discussion in the Discussion Groups which would meet in the afternoon. Meanwhile, Mr. Hancock was to be congratulated on putting before the Convention a straightforward, typically British and blunt point of view.

### PROPOSAL BY PROF. T. U. MATTHEW

Professor T. U. Matthew (Birmingham) suggested that the points raised that morning should be referred to the Research Committee for review prior to their being communicated to the Sections throughout the country with a view to papers being presented upon them.

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The Research Committee had fostered some excellent work in the past, but it had been directed mainly to technical matters. A change of direction from the purely technical aspect to a wider field, was now apparent including management functions and the principles of production control and production planning. The Research Committee would welcome an extension of its terms of reference to those fields.

This proposal was seconded, and it was unanimously resolved that a full report of the meeting should go to the major committees of the Institution, particularly the Research, General Purposes, Standards and Technical and Publications Committees.

The proceedings of the meeting then terminated.

Friday, September 24th.

DISCUSSION GROUP I

**PRODUCTION ENGINEERING:  
ENGINEERING PRODUCTION**

Chairman : A. McLEOD, M.I.P.E.

The Chairman, opening the Discussion, said that Production Engineering had made enormous progress in the past twenty years, so much so that it entered into every department of industrial activity. The Technical Committee had recently received for their consideration papers on such widely differing operations as heavy forging and the manufacture of radio valves, yet all had shown progress in general experience of production technique.

Inevitably, however, in such a virile body there was keen controversy on many important matters, and it was the purpose of a discussion meeting of this type to bring all shades of opinion to light. For example, should less attention be given to "paper work" in output schemes? Were organisation, time study, machine shop loading investigations, and production control departments getting a little out of hand?

Industry was now, of course, acutely instrument conscious, but were instruments properly understood and fully utilised? Was super accuracy becoming a fashion rather than a necessity? Would British engineers be well advised to sacrifice a little of their traditional craftsmanship in favour of cheaper costs and prices?

These were simply examples of the topics that engineers could always usefully discuss. The whole field of production engineering was open to the meeting, but as time was severely rationed—in the present fashion!—each speaker would be limited to a maximum of two minutes.

Mr. T. Fraser (Manchester) said he had had considerable experience of handling labour for a good many years and agreed with Mr. Hancock's remark at the morning meeting that if labour was properly handled productivity could be increased. Experience suggested that perhaps 80% of the people of Britain were good, 10% were indifferent, and 10% would never be any good. The trouble was that they did not understand, but once they were given an opportunity to go behind the scenes and see how things worked they usually became co-operative instead of an opposing factor.

The Institution had valuable experience at its disposal. It should not wait for the Government to approach it. He did not like committees, but in this instance he felt that a committee of ten who really knew their business could be set up to

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impress upon the Government that if it would be guided and advised by the Institution, this body could show it how productivity could be increased in Great Britain.

Mr. J. E. Baty (London) said discussions had taken place in Canada three years previously on the unification of screw threads. The American coarse thread and the British standard Whitworth thread had the same number of threads per inch, and the unification of form would make a lot of work interchangeable. Agreement had been reached with the Americans and Canadians at Ottawa, but unfortunately the Americans later sent over a deputation who did not agree with what had been done there.

The Government felt it was absolutely essential that there should be some common thread, whether it was issued as a unified thread for industry in both countries or not. A small deputation had therefore gone to America a few months ago and had settled some of the outstanding differences. What was now being done would not be issued as a British standard in the ordinary way but would be a provisional standard giving full information as to the unified thread so that it could be used in Britain and would be interchangeable with the American thread. If, in years to come, it proved acceptable, a change over to it might be made, so that industry on both sides of the Atlantic would be using a common screw thread. In the meantime, British industry would use the Whitworth thread but drawings issued by Government Departments would most likely contain the new unified form of screw thread which would have the Whitworth pitches as at present, but the fine thread would probably follow the American fine thread. In reply to a question, Mr. Baty said the angle of the thread would be  $60^\circ$ .

Mr. W. G. Marsden (London) said he felt strongly about the screw thread business and was relieved to hear there was to be a flat top. At the same time, he was sorry the standards had again gone into the melting-pot. In particular, he referred to the B.S.I Report No. 84, 1918, which was a very good specification.

Briefly, the minimum female was at least two thousandths bigger than the maximum male. That served well in many ways because previously assembly shops were apt to put taps through female components and also to run dies down males, thereby spoiling the quality of the control that inspection departments carried out, largely because the previous standard method was on the nominal size. Failure to identify this boon however, meant they were now back on nominal, with perhaps a thousandth thrown in, where plating was involved.

The Chairman observed that there was no answer to any of these problems, nor were they there to apologise for British standards or even to explain them. He recommended that note be taken of the

discussion and sent to Mr. Good, Director of the British Standards Institution. It might or might not be of use to him but it would come from practical engineers.

Mr. A. Oppenheimer (London) said the failure of the Government to call in representatives of the Institution to sit on the Productivity Committee was surely not a cause but a symptom. If the Institution could persuade public opinion that it had something to contribute, the Government could not but call it in.

Perhaps the best way to deal with the situation was that suggested by Mr. Fraser.

The problem would seem to be how to use the existing equipment, machinery and very often factory space to get better results. As production engineers they should be able to find a sound solution to that, and it was their duty to take the initiative.

The Chairman said it was open to the meeting to pass a resolution on these lines which could be placed on record and forwarded to the proper authorities through the Institution.

Mr. T. Fraser (Manchester) said there had already been some talk about his proposition which should, he thought, come not from a particular section but from the Convention as a whole. It might then be sent in the form of a telegram to the appropriate authorities.

Mr. J. R. Ratcliff (Eastern Counties) drew attention to two cases which in his view called for action. The first related to the supply of high carbon steel instead of mild steel, or B.S.15, normally obtained in five-ton lots, for use in fabricated structures. In one consignment a bar had broken in half in unloading making it necessary to examine the entire steel stock of the works, amounting to over 1,000 tons. It was then found that there were three separate suppliers delivering 55-carbon steel of very coarse grain size as "mild-steel."

The matter was brought to the notice of the Iron and Steel Board, with the suggestion that industry throughout the country might be interested. They replied that (a) this was just "one of those things," and (b) it would be impossible to identify the original supplier, (which his firm had already done in a previous letter.)

Secondly, his firm were continually being asked to pay a premium of from £2 to £6 per ton over the standard price for steel sections in short supply by people who had purchased and held them back against a rainy day. The authorities to whom these instances had been reported, however, stated that they had specific instructions to do nothing about such black market sales.

Mr. G. S. Greenfield (Birmingham) pointed out that the extra charge had, as it were, been legalised lately, inasmuch as there were many firms, particularly stockholders, who were selling

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sections which they quoted as electrically smelted at an extra £6 17s. 6d. per ton, although everybody knew they were not electrically smelted.

Mr. J. R. Ratcliff (Eastern Counties) said he was aware of the standard extra per ton paid for special classes of railings such as the Sheffield standard, but was referring to the common mill standard steel. The steel offered at premium prices was not from stockholders, but from others who could be fairly classed as scrap dealers.

The Chairman suggested that the meeting would do well to confine itself to technical problems.

Mr. J. V. Brown (Coventry) said as one who had spent many years on the assembly line, he would like to ask the members of the Threads Standards Committee and the manufacturers of threaded components to consider the more advantageous use of thread rolling for the male components and leave standard taps to take care of threaded holes.

Mr. A. A. J. Francis (London) thought that the sooner a compromise on screw threads was reached with America the better it would be for industry.

Mr. H. S. Hull (London) said he would like to congratulate the Standards Committee on the 60° angle for threads, which was easier to lay out and was used by 90 per cent. of the British, Continental and American engineering trade at the present time. He could not congratulate them, however, on the new taper standards. A standard taper whereby increases were proportionate throughout the range would have been much better, he felt. The Jarno was already in being and would have covered the full requirements of the industry, but it was deemed essential to follow America 100 per cent. when we should have stood out for a standard which really was a standard, and not a mixture of various types. The trade could have been informed that the old standards would run concurrently with the new standards over a fixed period, which would allow existing machine tools either to be brought up-to-date or replaced by the new agreed standards. This was done in America during the standardisation of drills, taps, etc., and after an agreed period any tool outside these ranges was deemed special. These special tools were still obtainable, but only at extreme costs. The same method could have been applied to tapers.

Colonel Warren-Boulton (Calcutta) asked whether the Standards Committee had done or proposed to do anything with regard to electrical fittings. Those who travelled extensively in England had to carry round a pocketful of plugs but that was not the case in America, where fittings were standardised.

Mr. A. G. Harling (North Eastern) said that perhaps this was not the place to advertise, but the firm he was employed by had

been making, for sixteen to eighteen months, a plug and socket for fuses which the housewife could easily handle. In his firm, capacity existed to produce 60,000 to 70,000 a month. He could assure Colonel Warren-Boulton that the majority of electrical organisations were getting together to try and solve difficulties of the kind he had mentioned.

Mr. H. S. Hull (London) described his difficulties in inducing a contractor to supply three-pin plugs, although these were specified by the housing authorities. He had found that there were five different sizes of three-pin plug and various types of switches, but they were not interchangeable. Why did not the British Standards Institution or some equivalent body endeavour to establish basic fittings?

Mr. J. E. Baty (London) said he did not know the position with regard to plugs, which were not in his line. The British Standards Institution did not originate any standards themselves. A request for a new standard must originate from some external body. The Institution of Production Engineers made many requests to the British Standards Institution and it was up to those present to make any requests thought necessary through the Standards Committee of the Institution.

With regard to tapers, Britain had tried to come into line with America, which had produced a series of tapers satisfactory to the bulk of industry.

With regard to screw threads it had been realised by the B.S.I. Screw Thread Committee that it was probably a mistake to make both the internal and external thread the same nominal size, i.e. with no allowance and there would be a definite clearance between mating threads in the Unified Thread Provisional Specification. Any revision of the Whitworth thread would probably embody the same feature.

Mr. W. A. Melhuish (Manchester) said that he readily accepted the Chairman's challenge with regard to paper work and systems because despite the importance of screw threads and electrical fittings, and other practical aspects of production work, paper work and systems was the most important subject they could discuss. It was perhaps even more important than the right handling of labour, with which the Convention had been so concerned to date. Indeed, he would suggest with all humility that the greatest improvement in production in Britain would come through production engineering putting its own house in order.

He had spent many years in industrial consultancy, a form of activity that was disliked by many, and it was his experience that a great many engineering companies were suffering from lack of system in the production engineering department. In the average

firm there was far too much paper work, and if production engineers were to paste—periodically—a copy of every form they used on the office wall, they would receive a shock.

There was more in production engineering than the actual production of goods. It had been argued in the past that whatever system was employed a department would not turn out more than its rated capacity. That might be true, but it would save that time-lag which repeatedly slowed down production in this country. Many bottlenecks were entirely due to the lack of system and method of the production engineer.

Mr. A. B. Armstrong (Manchester) said one factor seemed to have been overlooked in regard to paper work. The bulk of the engineering companies in Britain employed about two hundred people. According to his experience, a big obstacle to production was lack of paper. Information was tucked away in the heads of a number of individuals and was not accessible to anybody else. Mr. Hancock had referred in his address to the "know how," but how could people expect to know without having information?

There had to be some means of disseminating information, although the design and quantity of the paper work ought to be scrutinised. He would rather tend to beware of the over-emphasis on too much paper and to aim at achieving increased production by more attention to methods on the shop floor.

Mr. S. T. Pigott (Coventry) thought that for the small concern the weakness lay, in the main, in the fact that the existing systems for production were far too massive and there seemed to be no attempt to fit a system to the actual minimum requirements of a small organisation.

Mr. J. E. Attwood (Western) speaking as General Manager of a large company employing a great number of people, said that his company had recently commenced the overhaul of their system. The reason why paper work accumulated, he thought, was because no attempt was made to integrate it into the whole works plan.

There was scope for Planning Engineers, with a wide knowledge of all phases of factory problems and processes, and for the man who could plan the paper work to cope with both large and small organisations. In the case of his own company it had been found possible to dispense with some of the paper work in certain sections, while others were found to need more.

As to forms, the Works Manager of one of the sections arranged for every form in use to be laid out for his inspection and it was immediately realised that replanning was necessary and would achieve a saving in manpower; subsequent events had justified his action and the department received a general overall benefit.

Mr. W. A. Melhuish (Manchester) agreed that a number of

small firms were suffering from a lack of paper. He had had in mind the larger and medium-sized plants. There were a number of companies who specialised in reorganising businesses employing from fifteen to three hundred people and extraordinarily good results had been achieved. Paper work itself was only one aspect, however, because it was in general pre-production planning that British companies fell behind their counterparts in the United States of America.

Mr. C. J. Luby (Western) said it was his experience that much of the complication in paper work was due to the failure of the people concerned to lay down an organisation which could be readily understood by those who had to work it. This led to the multiplication of paper work because information could only be disseminated by sending notes to large numbers of people, in the hope of contacting all interested parties.

The first and foremost object in considering overheads and the streamlining of an organisation, must be to draw up some form of functional family tree. Adjustments would have to be made, of course, to suit circumstances as they arose. This was the way to reduce paper work and consequently overheads.

Mr. G. Cole (London) thought it impossible to set down a family tree for a small organisation employing twenty to twenty-five people. According to figures given recently by the Chief Inspector of Factories there were 233,000 factories in Britain within the province of factory inspection. Only 4,750 employed over 500 people. Nearly 200,000 of the remaining factories employed under 250 people, and a very large percentage probably employed under seventy-five.

Mr. J. R. Ratcliff (Eastern Counties) said he had had the advantage of moving from a large firm of 2,000 with a colossal amount of paper work to a small firm of 200 with little or no paper work except Purchase Orders, Goods Inwards Notes, and Customers' Orders, which went through the accountant's office. Everything such as Stock Order, Part Lists, Progress Charts, etc. had had to be initiated.

He thought Mr. Luby was right in advocating a family tree. There was probably little division of opinion between Mr. Luby and Mr. Cole. A family tree did not mean a position on the tree for everybody. In some cases twenty-four out of twenty-five jobs might have to be done by one and the same individual, and one job only by another individual. But that should be stated clearly at the outset and they would then know where they stood.

Mr. W. G. Marsden (London) said excessive paper work was not found to be very necessary in the very large or the very small

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firms and why the intermediate people became involved in so much paper he could not imagine, unless they did so in an attempt to control batch production.

A certain amount of paper work was necessary in order to control work from fifty operators upwards, but where there was a management audit the officer responsible usually got out the necessary forms and their number could be restricted to about seven by the use of extra columns, squares, and so on. The drawing office was often a great culprit. There would be a very great saving in paper work if the drawing office could make its master document fully extended with blank columns for further details, space for the planning engineers, buyers, chasers, and others. If this prime document went out properly from the drawing office and the other paper work followed rational lines, only a modest amount would be needed.

Mr. H. R. Spender said paper work had been the bugbear of the engineer for years. As an accountant he thought there was too much paper work and he tried to cut it down as far as possible. A distinction should, however, be drawn between quantity and quality. In a business known to him in the Midlands where there were 20,000 employees it was impossible to see through the paper. In another employing 250 it was the same, but in the latter case errors seldom occurred because the paper emanating from the factory was original paper and everybody worked from it.

Following on Mr. Luby's remarks, he thought what was wanted was system.

Mr. W. A. Melhuish (Manchester) suggested that the Convention might well formulate a resolution asking the Institution to devise ways and means of preparing systems suitable for all types of companies. There had been blue-books during the war, but valuable post-war experience was now available, and it should be possible to draw up systems applicable to the small, medium and large firm. This was very necessary.

The Chairman said he was prepared to accept such a resolution : it would serve as a useful guide to the Institution.

Mr. T. Fraser (Manchester) thought that paper work should be reviewed from time to time, say, once a year.

The best way to find out whether a system was working efficiently was to walk round the factory and ascertain whether effort was being wasted and where time-saving could be introduced. He was a firm believer in time and motion study provided it was not overdone, but unfortunately it was often considered applicable only to mass production work. In fact, it could apply to any kind of work, heavy or light engineering.

Machine shop efficiency was also important. The average foreman would probably claim that his efficiency was 90 per cent.,

but of course this was ridiculous—65 per cent. was considered very good. A lot of time was wasted in heavy engineering in waiting for cranes, and in the case of a radial arm drill, three loading tables could be fitted, one could be used for the drilling operation, and the other two loaded as convenient so that the radial arm drill could be used for continuous drilling. The same idea could apply to planers.

Mr. J. Attwood (Western) said that the handling of components and products had not had enough attention. There were well known methods of handling which could be applied to factories not running on flow lines, but planning engineers tended to neglect this section.

Mr. E. G. Holberry (Wolverhampton) emphasised the importance of co-operation between the Sales Department, the General Manager and the Planning Engineer. In his firm the Sales Department referred enquiries to the General Manager, the price was looked into and the Planning Engineer was consulted before an order was booked. The Drawing Office, in its turn, kept the Planning Engineer informed of its progress. Details were entered in the appropriate column of the schedule and it could be ascertained at any moment what production would be at any time within the next eighteen months. The army technique was applied to administration which had been streamlined. As a result production had gone up 250 per cent. in eighteen months. Overheads had gone down by one-third despite increased staff.

Mr. L. J. Tolley (London) said that the value of a system could be assessed by whether it cost more than the amount of money it saved. The Production Engineer in a large factory particularly could save his paper work by adequate factory planning.

In his opening remarks the Chairman had mentioned craftsmanship. He himself—and, he thought, a lot of others—believed in a mass production economy. Craftsmanship was a very fine thing, and it was good for an individual to be able to make one particular article better than anybody else, but he had still only made one. The craftsman who would do his country and engineering society generally most good was the one who could make the tools and plan the methods by which thousands and millions of those articles could be made.

Mr. J. H. Turner (Glasgow), referring to Mr. Holberry's remarks, said he had always wanted to meet the representative of a firm who could say what was actually going to be produced some 18 months ahead and the member of a Sales Department who had really determined that he would be able to deliver before selling the product.

With regard to paper work, he thought confusion arose because some people in an organisation were not always fully educated in

the importance of the part they had to play. The main function of paper work was to get every operator working on a particular job at a particular time, and to a certain extent most systems could work to this end providing everyone carried out their part of the plan.

In his factory recently when questions arose from some members of the manufacturing staff on the effective working of the system, it was arranged for the Chief of the Planning and Progress Department to give a talk on the operation of the system. This was followed by discussion and although there was certain criticism, everyone went away conscious of how the success of the system was dependent on the particular part they had to play.

Let everyone appreciate the importance of their function in the general plan and its operation would achieve a far greater degree of success.

Mr. E. G. Holberry (Wolverhampton) said he suspected Mr. Turner had challenged him as to delivery. If he promised goods next month, they would be delivered.

His firm had recently had a target to achieve by the end of July, and each man had been approached individually and asked whether he would work seven days a week and overtime. Not one man had refused. The target had been achieved, which could not have been done with the five-day week. In other words, the factory had some good workmen, including the shop stewards.

Mr. F. J. Jupp (Southern) said he was Works Manager of an aircraft company employing about 4,000 people. A new factory had been started in Bournemouth, where skilled aircraft labour would not be expected to exist, and at that factory, the new "Ambassador" had been built.

The empty weight of the "Ambassador" was about 32,000 lb. and under the blueprint routine roughly 32,000 drawings would have been issued. The "Ambassador" prototype had been produced with 6,000 drawings and 250 "Loft Plates." The original design work was prepared in the Drawing Office by skilled draughtsmen, in the usual way, and passed to the lay-out department where it was drawn out to full scale, with the assistance of magnifying glasses, on to 8' x 4' lacquered "Loft Plates" and true to within one-hundredth of an inch. These plates were reproduced in the Photographic Department on to template material. The operators, therefore, worked to a line already marked out for them. The total estimated saving in the workshops amounted to 100,000 man hours saved on the original system. Quarter-scale photographic reproductions went to Planning and other departments as a normal drawing issue and the overall saving of paper probably amounted to several tons per aircraft type. It might be considered that the initial cost of photographic reproduction would be pro-

hibitive to a small firm, and that the system would not be applicable to a number of industries, but larger firms might be prepared to sub-contract the service, and for anything made of plate to close limits, the system was bound to pay.

Mr. E. G. Holberry (Wolverhampton) said the remarks made about the production engineer putting his house in order, machine shop efficiency and military administration were very important, because the Production Engineer was inclined to become too engrossed with his technical work. He could be much more effective if he gave thought beyond the ingenious devising of tools, to the movement of work and work flow. He could save much time by taking a share in the administrative burden as distinct from technical responsibility.

Mr. F. H. Perkins (London), referring to Mr. Fraser's remarks and to the question of time and motion study, said that he was not sure some of them followed that term. His own company adopted the term "work measurement" to embody the matters of elementary process study, motion study and time study in a logical sequence. Was it the feeling of members of the Institution that there was at present a serious lack throughout the country of facilities for the training of people employed in that work? From his own experience there was difficulty in obtaining courses of this character, and this had caused his own company to introduce their own training courses. He wondered whether the Institution did not feel it had a part to play in developing facilities that could be made more generally available to industry as a whole.

The Chairman said he would not like the meeting to close without placing on record, for the guidance of the Institution, those subjects which might usefully be referred to Sections with a view to papers being presented on them. Among subjects on which papers should be encouraged, he thought, should be included the following:

A Rational Scheme of Paper Work.

Time and Motion Study, or Work Measurement.

Mr. C. J. Luby (Western) suggested that attention be given to the Principles of Administration in the Production Field.

The subject of Shop and Works Transport was also suggested.

The Chairman thought the Institution might also consider Incentives and Satisfactions in relation to piece work. A study of that subject would be of value throughout the country.

With regard to other points which had arisen during the discussion, he understood Mr. Fraser's suggestion for a telegram to the Ministry of Supply would be referred to the Convention as a whole.

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The Chairman said this matter would be placed in the hands of the President.

Secondly, Mr. Melhuish had made a suggestion that certain action be taken, but now intimated that his proposal was covered.

The Chairman said that it only remained for him to thank them very warmly for a most profitable discussion.

Mr. T. Fraser (Manchester) having proposed a vote of thanks to the Chairman, the proceedings terminated.

DISCUSSION GROUP 2

**SPECULATION AND ENTERPRISE AS  
FACTORS IN PLANNING FOR REPETITIVE  
PRODUCTION**

Chairman : H. W. BOWEN, O.B.E., M.I.Mech.E., M.I.P.E.

The Chairman : As Chairman of this meeting, I want to try to get a discussion going on the subject of speculation and enterprise as factors in planning for repetitive production. This is a very wide subject. It covers a fair amount of economics, and it comes very close to the point of actual production layouts. It brings in such matters as sales and the whole organisation of a production firm, whether it is in production, in the financing of the product or in the selling of the product when it is made.

In considering repetitive production, such as the mass production of cars, tractors, radio sets or any commodity of this kind, the first risk involved is the financial outlay based on a fixed product, and the further risk of this product not finding a sufficiently large market to absorb the economic output.

In the original design we must be sure, before even considering manufacture in quantities, that the design is required in the quantity which we have originally envisaged ; that it is the type of design that will appeal to the consumer who is going to buy this particular product, and that the price is competitive. The price must be competitive with that of all other suppliers, and, if possible, the product must be a better job, in quality and in performance, at a cheaper price. It must be competitive before the risk can be undertaken.

Assuming that the design has been so tailored that it is competitive as far as price is concerned, then the production engineer should be reasonably certain that there will be no further worry provided that his production layouts and his methods are the best possible. How often do we say : " If this thing had been properly designed we could do it for the price " ? Assuming that the design is right, the next questions are " Are your layouts right ? Is your method of manufacturing right ? Are you losing time by movements ? Are your repetitive operations in the right sequence ? Is your material coming in according to your schedule, at the right time ? " The biggest waste in any production is what we call waiting time.

Having got over that hurdle, the next risk involved is a real one. We have to lay out and plan the plant and machinery required, together with the tools necessary to produce the product in the cheapest manner. This involves the choice of the best plant and

equipment at the lowest cost, and it is here that we are faced with a difficult choice in connection with the machinery or the plant itself. We start on a project and we have to consider this question : "Are we going to put in general purpose machines or are we going to make machines which are in themselves jigs to do the job or the sequence of jobs on the product ?" If we have general purpose machines and we change the product, the machines are still useful. If, on the other hand, we have special purpose machines, in nine cases out of ten they will be useless if we change the product, or even, in many cases, if we modify it. Therefore that is another risk in the consideration of the actual manufacture of the product.

Having made this difficult choice in connection with the purchase of the equipment, the next consideration is material storage, transport facilities and distribution. These have to be carefully considered in line with all the other deliberations connected with the final distribution of the product to the ultimate consumer. We might sell through agents. We might have distribution from the factory and sell through retail stores. We might have definite distributors, one in every district, to handle the product.

All these things have to be planned with regard to the way we intend to distribute the whole of our products, so that we shall not have confusion due to the fact that the products are not properly sold or properly advertised or are not distributed to the places where they are required.

At this stage the risk and enterprise involved have come very clearly into the picture. Careful consideration must be given to the possible technical developments that will render a large amount of the invested capital redundant. Suppose, for example, that we have a motor car which we have designed in such a way that, as far as we know, it is the best product possible at the time. Development is going on in our own plant and amongst our competitors, and there is a risk that, in order to sell our product, not necessarily in the same year but perhaps in the following year, we have to modify it extensively. We must cover in our profits all expenses and reserve sufficient in the previous year to cover modification charges if necessary. Furthermore, we must not forget that tooling is probably the most expensive item. Many a firm writes off its tooling in the first year or even in the first six months of running a production line, but that cost, while it may be looked on as capital, is not really capital cost in the first instance. It should be paid for in the cost of the article. If there is not enough sold in the first year to cover it, there is a balance for which cash must be found.

Then there is the question of material forward purchased. We purchase against delivery dates, and I think all of us have suffered

lately by ordering our material against a thirty weeks' delivery. In a few weeks the whole of that material is delivered. All that money is lying idle.

If, after this, the product will not sell or is not wanted or is too late on the market, the producer has definitely burned his boats and has to face a huge loss.

I have not laid down anything very definite. I have made these points in such a way that I hope some of you will disagree with me and that from that disagreement I shall get your ideas. We as production engineers want ideas. They are much more valuable than anything else, and if we can get ideas in a discussion group of this kind we can put them all into a pool, so that every one of us can benefit from them.

That, I think, is a brief outline of the terms of reference as given to us on the subject which is before this meeting.

Mr. B. Greathead (London) said that he did not think the production engineer should be concerned with the financial aspect. Sometimes, however, a product was a good job from the production point of view and yet it did not sell; there was something wrong. The point that he wished to stress was that before the production engineer proceeded with the work there should have been as much care put into the preparation of the factors required as the production engineer put into his job. If more time and science was spent on market research, much better results would be achieved.

The Chairman, referring to Mr. Greathead's mention of the financial aspect, said it should not be forgotten that the managing director of a firm might be and in many cases was a production engineer and that the salesman might also be a production engineer. Production engineers, whether they were process engineers or working out the methods of manufacture, or whether they were selling the component or were managing directors or even chairmen of companies, were still production engineers, and he wanted the broadest point of view to be taken at the present meeting.

Market research was very important and most firms carried it out. Whether that market research was done well or badly, it was certainly one of the risks.

Mr. Field (Luton) said he would like to appeal for a little more speculation and enterprise. He thought that industry to-day was suffering very much from pre-planning. He hoped the Chairman would tell the members how they could use market research to the best advantage. Those who used enterprise were successful although they might not set up very large organisations for market research.

Mr. F. P. Laurens (London) said he thought it was important that industrialists should carry out their market or commercial research together with their deep research, with a great deal of

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foresight, so that they could have various projects planned and prepared in readiness for the market. The production engineer should be brought in at the very earliest stages and be kept right up-to-date with what the research department was doing, and he should prepare alternative schemes for the directors to consider. The salesmen should come back with some very definite information about the market value of the project in question. He remembered one case in which a machine was conceived to supersede one that was already on the market, the popularity of which was already waning, but the salesmen could not give sufficient indication of the numbers that they could sell yearly. In consequence the directors were forced to select one of the middle course schemes which the Production Engineer had prepared, with greatly reduced tooling figures, with the result that the job was put into production in not quite the way that was desired. At the end of the year the salesmen said they could sell at three times the rate, and then the production engineers had to think again, patch up their tooling and rearrange their plant. The final result whilst attaining the increased output, did not of course give the results which would have been obtained had the Production Engineer's first scheme been adopted at the outset.

Mr. W. Logan (London) said the Chairman had stated that very often a product was dated to come into production at a certain time and it was not known until some time afterwards that it could not be got into production on that particular date. He thought that meetings should be held prior to the completion of the earlier stages, so that the progress of the various stages of the work could be ascertained.

Very little had been said with regard to the standardisation of parts, but there was one large company in this country which carried out standardisation to a considerable extent.

Mr. P. R. Elsdon (London) said that he was principally concerned with the subject under discussion from the angle of machine tools, i.e., the equipment for production. He was fairly closely connected with the American machine tool industry, and the point which struck him about it was that it had a much greater market for its products, so it had a bigger problem in deciding the right products for that market. Special machinery was therefore used much more than general purpose machinery. Under the conditions in this country, firms had to use general purpose machinery as much as possible. Therefore he would suggest that standardisation of products was a very important matter in the post-war production of this country.

He also wished to make a plea for standardisation in tooling,

whereby production could be maintained all the time, with no hold-ups during breakdowns, and he would suggest that this would play an important part in production in the future.

Mr. M. Seaman (Manchester) said he wished to try to bring the words "speculation" and "enterprise" into the framework of repetitive production, because in regard to various industries he had noticed that on the questions of production preparation and of market research, things had become very hazy through lack of what might be termed a national plan. In the radio industry, for example, there had been times when hundreds of thousands of sets had been left on the shelf through lack of a plan. A study in the United States before the war had revealed that the speed of radio production—organisation to first deliveries—in that country was very much higher than that of the average unit of the best organised units in this country. Whilst the basis of any production was repetitive production, it presumed a national unit of a market, or perhaps a national unit with extensions. It might be that speculation and enterprise required, both in regard to production and in regard to market research, some sort of basic plan. There seemed to be possibilities of economic calculation of what was satisfactory for any one nation, and he thought that might well be a study for the production engineer to take up as a national concern.

Mr. W. G. Thorpe (London) said he would like to ask whether speculation and enterprise were commercial assets today. He thought that was a very pertinent question, because a company might set out to expand and the board might be willing to spend £100,000 in twelve months; more material was presumably available and plant could be delivered within the next twelve months, but the first thing that happened was that on an allocation of steel, the company went to all the steel people but could not get any, its plant was put back twelve months and the provisions of the Town and Country Planning Act said that the company could not have a licence.

There were two fundamental distinctions in his question. One was the distinction between the purely servicing company and the company which manufactured a proprietary line, and the other was the distinction between the large company and the small company. The company which manufactured a proprietary line today prospered but the servicing company was in a much more difficult position, being controlled by everything outside its own works. With regard to the distinction between the large company and the small company, the former had power, weight and authority. Large companies formed, he believed, about 18 per cent. of the total number of companies operating in this country at the present

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time. The company which employed under five hundred people had not the power and the weight which would enable it to get what it wanted at the right time.

From his own experience during the last fourteen months he would say that speculation and enterprise were not commercial assets today, but he would like to hear the views of other people.

The Chairman, referring to the comparison between the large and the small company, said that the large company had advantages from the point of view of finance and power, but in many cases the small company could use its labour to better advantage. The managers of small companies were very much closer to their people than were the managers of large companies.

Mr. W. Logan (London), said that he was in charge of a factory employing about 150 people, and he knew the peculiarities, the family life, the likes and dislikes, and so on, of each one of those people. It should be borne in mind that in the majority of cases the overheads of the large company were greater than those of the small one.

Mr. J. F. Gibbons (North Eastern) said that the policies of the large and small firms were different. The larger firm very often decided to produce a very large quantity, whereas the smaller firm would decide to produce a much smaller quantity and then, as its sales increased, would equip its shops to meet the additional demand. That in itself handicapped the small firm's plant to a certain extent, because if the firm had decided in the first instance to produce a larger quantity it might have been tempted to put in special purpose machines, whereas by starting on a small scale and increasing the production the firm was forced to put in general purpose machines. He thought that the matter came back to the question of market research, which was very important indeed.

Mr. R. H. Davis (Sydney) said that Mr. Gibbons had mentioned a fundamental point. In asking himself what speculation and enterprise meant, he had come to the conclusion that in the main production engineers lacked the ability to find out what the public needed, and, as it was useless for them to make a product which they could not sell, there should be co-operation between the production engineers and the salesmen. Then came the question of market research. How much would the market pay for the particular goods in question? Could the goods be made by a small firm or was a gigantic organisation needed? Therefore he thought the fundamental point in the discussion was how production engineers could best make that which the public needed.

Mr. R. H. Jane (London) said that much could be done to educate the public taste. People could not be expected to forecast technical improvements, and therefore market research on its own

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tended towards the acceptance of the best features of current production. Manufacturers were thus encouraged to continue with well-tried lines.

Novel ideas were not readily accepted in this country and as examples of this he mentioned several cars and motorcycles incorporating revolutionary ideas, later accepted as standard, which did not sell because the public preferred established models of proved performance.

By contrast, he believed that when American firms decided their product was good and had technical advantages, they set out to produce it in quantity. Good advertising coupled with enlightened public taste ensured sales. This method gave great scope to the production engineer, for with a high output target he was able to tool for mass production and so add cheapness as a further sales incentive.

Good advertising could teach home consumers to expect progress. This would not only stimulate sales abroad, but would allow production engineers to concentrate on quantity production as opposed to stop-gap methods, with small batch production.

Mr. R. L. Jebb (Calcutta) said that with regard to the Americans being ahead in forcing their goods on the customer, was the population of this country similar to that of America? About ten years ago a radio play had been broadcast from Cleveland in which it was announced that the Martians had arrived, and people believed it. Would the public in this country believe it? If so, anything could be sold to them.

In Calcutta people had got beyond the lathe, but a fortnight ago he had visited the Machine Tool Exhibition in London and he could say that 75 per cent. of the machines shown there could not be sold in India and should not be sent there, because there was not the skill to operate them. Tool setting would take nearly all the time and there would be little time left for operation. About fifteen to twenty years ago he had been talking in Calcutta to a representative of one of the largest machine tool firms in this country and had told him that his firm did not put out a single machine that was fit to run in India, as none of them was dust-proof and the lubrication was poor. A great deal of the pushing of sales in India was not successful because machines supposed to run for ten or fifteen years would not give a year's service when operated by the ordinary Indian village labourer. The machines had to be foolproof. India had hardly any tungsten carbide jobs yet; 90 per cent. were carbon steel, 9 per cent. high speed steel and 1 per cent. tungsten. There was a huge market in India, but it could be satisfied only if the suppliers in this country understood who the users would be. The real population of India for the

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industry was not 300 million to 400 million ; it was nearer thirty million or even three million ; that was the market for foreign sales of anything in the nature of machine tools.

The standard of production in this country to-day would not be achieved in India for probably another twenty-five years. The bulk of the labour in India was only fit to use the plant of about 1910 or 1920. Firms in this country could not export to India the goods which were ideal here, and they obviously could not manufacture a design which was twenty-five years old.

Apparently anything could be sold to an American ; he himself was not sure about that ; but anything could be sold to an Indian if it was cheap and was within the operative scope of Indian factory labour.

Mr. D. Brice Pardy (Bristol) suggested that the modern designer was too conservative. Did he consider the public and what the public wanted ? Did he simply provide what he thought the public needed ? Did he study the psychology of the public as far as the article which he was designing was concerned, so that he could give to the public the thing which was definitely required ? When enquiries came in from abroad—for instance, from East Africa—did the designer provide what the enquirers wanted or did he give them something better ? They might want something elementary to supply their particular wants and needs, and if the designer gave them something more complicated or more scientific it might not appeal to them.

He thought that the designer should co-operate more with the salesman, and if the article could be produced from the design point of view the production engineer would not fail to produce it.

In America the luxury of to-day was the necessity of tomorrow, the public demanded it and the firms were able to produce it. Until firms in this country could make their productions a necessity to the public, they would have trouble in selling them.

Mr. J. E. Dyson (London), referring to the risks in repetitive production, said there was one which the Chairman had not mentioned. If a firm had a design running beautifully on repetitive production, there was a very great tendency to leave it at that, and he thought that was one of the risks at the moment. Market research had been mentioned, but not research at the other end, and he felt that, even when a firm had a successful product they should not overlook research at the other end, which should go on all the time.

The Chairman had said that it was essential for a firm to make a product as good as anyone else's and possibly a little better and a little cheaper, but he did not quite agree with that, because

he had had considerable experience in selling an article which was more expensive than anyone else's and he had sold it well on quality alone.

Major G. Fooks (Western) said he thought that when firms were planning new products they should also consider a good after-sales service, which could help a very great deal in market research. It was only by having fairly close contact with the customers and potential customers that a sales organisation could advise on what could be done in the following year. He had been abroad for the last six years, and he had seen British goods coming back to a market that was wide open and shouting for them, and he had felt that insufficient information reached home. Designers and production engineers would be glad to have information which would enable them to improve their products so that they could be sold abroad. Sometimes products needed to be simplified for use with native labour. A good after-sales organisation should know what sort of spare parts would be needed and at what rate they would be consumed, also whether and in what way an article was not quite suitable for certain export markets.

Mr. J. Silver (Birmingham), referring to the title of the discussion, asked whether the members present were satisfied that a number of firms in this country showed speculation and enterprise. Were there not many cases in which production engineers were hampered by an article being produced first in a small quantity, then in a slightly increased quantity and finally in a large quantity? In such cases there was a lack of speculation and enterprise, which very often resulted in complete re-tooling. If enterprise and speculation had been shown in the first instance, the article might have been produced more cheaply at the beginning.

There was in this country one leading car manufacturer who was showing speculation and enterprise by dropping all his models with the exception of one, and it would be interesting to see the result of that. It had to be assumed that market research showed that the car in question would be sold in quantities, but the benefits of this action had definitely been passed over to the production of the car in question in the first instance.

Mr. R. L. Jebb (Calcutta) said he would like to know the name of the car to which Mr. Silver had referred. People in India were rather disappointed with the standard of the American cars of the last few years, which in general were not up to their pre-war standard, and he thought that British car manufacturers could take the market easily if they wanted to do so.

Mr. R. K. Allan (Luton) said that the speakers so far had placed emphasis on the thinking out of some design and then trying to force it on the public. That might be a wrong impression, but his own approach to the subject was slightly

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different. He proposed to confine his remarks to the reasons for or against the introduction of a new project and the study of it as regards design.

If the present national situation was viewed at all seriously, the first question must surely be : " Will this article that we propose to produce or the planned change in design have any real utilitarian value ? " That question was prompted by the fact that nowadays there were apparently too many "gadgeteers." Most people were attracted by something ingenious, a clever mechanism, great accuracy of manufacture or a beautiful finish, quite apart from the intrinsic usefulness of the article or the necessity for its superlative quality. It must be admitted that such things had a certain " stimulus " value, and he was definitely not advocating that otherwise serviceable goods should be produced with a shoddy look merely for the sake of austerity. In more spacious days there would be room for luxuries, gadgets and expensive details, but for the present he suggested that there would be great gain to the national economy by avoiding the production of goods of the " catch-penny " variety and by reducing frills to a reasonable minimum. The production engineer usually had little or no direct influence on what should or should not be made, but he had opportunities of indicating where modifications of finish, limits and even change in design would reduce costs and therefore risks.

With the broad details of the proposed commodity formulated, design proper began in the drawing office, and it was there that success or failure was, to a large extent, determined. From that point of view the designer was as much a production engineer as anyone who had a say about the means and methods of actual manufacture and he should therefore be well informed about manufacturing facilities. If the design was of a complex nature, consultations should begin even at the rough sketch stage, otherwise a tremendous amount of time might be uselessly expended on the drawing board. The production engineer would have such complete knowledge of the machines and tools available as would enable him to offer valuable suggestions without encroaching too obviously on the functions of the designer. The foundry manager should not be left out of the discussions, for he also could make important suggestions at this stage, according to the foundry equipment and the quantities anticipated. Yet another expert might be useful before the general design was finalised, namely, the "stylist" in design. In the case of some classes of goods, such a man might well be more effective in promoting sales than all the rest of the staff put together. Mr. Allan was not aware, however, of any engineering concern specifically engaging a man for that sole purpose, nor had he met one personally. The men with the gift of overcoming ugliness should be found and given a chance,

but they should not be allowed to impose suggestions which would produce a further crop of grey hairs for the works personnel or add unduly to the costs of the job. Stylised design need not be out of harmony with utility, because eye appeal was mostly sweep of line, a judicious disposition of surfaces or perhaps even a simple covering to hide an ungainly appearance.

After completion of the general layout, detailing of component parts began, and at that point the production engineer was on surer ground. His opinion should be accorded full consideration at the outset. Possibly the simplest and shortest method to adopt was to have the drawing of each part completed and a copy submitted to the production engineer for study before the wheels were set in motion. The production engineer might propose an auxiliary lug here, a fitting strip there, or a chucking diameter at another place, to facilitate holding during machining. Revised limits or a different surface finish might be suggested according to the capabilities of the machine tools available. The draughtsman should be taken into the shops to see for himself. Such a course would provide excellent experience for both production engineer and draughtsman.

The designer-draughtsman must keep before him the importance of utilising stock sizes of raw material to the fullest extent and should adhere to B.S.I. standards to the very utmost without interfering with the function of the part concerned.

When serious differences of opinion arose they might have to be ironed out in the presence of designer, technical manager and works manager, and, as a general rule, the chief designer should be allowed to make the final decision.

Even with all this speculation and planning, however, snags were almost certain to arise as the work proceeded, and disturbing features might appear when the article went into service. Such things were perhaps inevitable with any enterprise of consequence, but, by the properly directed co-operation of all parties concerned there would be the satisfaction of knowing that the financial risks involved had been substantially reduced.

Mr. F. Austen (London) said that efficiency was really tied up all the way down the line with the board of directors, with the designing, with the efficiency of the research and with the production engineer, but very often there was not any measurement of efficiency in those directions. There was a measurement of efficiency on the factory floor, but the efficiency on the factory floor was absolutely dependent on all these other factors of efficiency.

Mr. J. K. L. Murray (Southern) said that the products of his company were of a type that did not reach the general public, so he would ask a question with regard to the production of items that did reach the general public. In the case of household goods, his

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wife often said : " You can see that a man designed this ; a woman would never design anything like it." Would it not be an advantage, therefore, for a company to have a woman adviser on its pre-sales staff ? Possibly some companies had already adopted that practice.

The Chairman said that there were in fact women advisers on the pre-sales staff of some companies, and their advice on the utility and style of range of products for sale was carefully considered. As to the question of styling referred to by Mr. Allan, large companies had a styling department to look after this part of their business. They also conducted a kind of Gallup poll through a large cross-section of the public to find out if their product was likely to sell well when put on the market.

Mr. A. Broadhurst (Manchester) said that judging from what previous speakers had said there seemed to be a large number of paper-work production engineers present. His own company manufactured everything in their factory for someone else ; they did not make any complete article. They did not care what quantity they were asked to produce. Over a number of years they had ploughed back their profits into purchasing a fair amount of general-purpose machinery, with which they could plan for big production of an article, and probably supply people with many goods more cheaply than they could make them in their own factory, for the simple reason that the company had used a great deal of enterprise and real speculation in buying the machinery first and getting orders to keep it going afterwards.

Mr. R. H. Davis (Sydney) said he wished to remove any misapprehension on the part of the members present that the conditions in Australia were like those in India. There were fine service stations in Australia and men who knew how to use cars. Therefore, when firms in this country were thinking in terms of Australia he hoped they would provide something better than that provided by the Americans.

A written contribution was received from Mr. J. E. Hill (Yorkshire), who suggested that the scope of the discussion should include one very important factor, which might be termed " the relation of the operator, male or female, to the machine." That point had struck him very forcibly when he had spent about fourteen days recently at the Machine Tool Exhibition at Olympia, where he had been greatly impressed by the improvement in design and the many new features incorporated in machine tools for the rapid production of component parts. After some further thought it had been brought home to him, unhappily, that perhaps British firms in general were not using efficiently and effectively the machine tools already in their possession. Could they, in view of that, use the more productive machines exhibited to their fullest capacity ?

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Therein lay a problem of speculation for anyone interested in considering repetitive production. He felt that the problem could be solved only by a careful planning of the way in which operators should be trained and the incentive and welfare systems to be decided upon in any new venture to produce cars, tractors or radio sets, suggested by the Chairman. He thought that the risk involved in a successful venture of this kind, if the subject was not closely studied, could be a very real one.

He wished to refer also to a factor already mentioned by the Chairman, namely, the design of the product for manufacture, and he would add to that the importance of quality of manufacture. In his opinion this country, as a nation of manufacturers, could not hope to produce the same quantities as the Americans, who had the raw materials, the man power and a purchasing force within their own borders which enabled them to produce much more cheaply than could be done, generally speaking, in this country. If British industry was to be successful, he believed that consideration must be given to making goods of a very high standard of excellence, and, if that was so, much more consideration must be given to the training schemes for the skilled personnel responsible for the design and manufacture of the equipment and tools in the type of factory producing high quality commodities. Consideration should also be given to the speculation side of the business, with regard to Government control, etc.

The Chairman, before summarising the discussion, referred to Mr. Broadhurst's statement that there appeared to be a large number of paper-work engineers present. He said that he knew at least two-thirds of the members present had been very excellent craftsmen before they became production engineers. If, through their enthusiasm, they had talked during the discussion in a paper-work sense (paper work came into the speculative side of the subject), it should not be thought that the engineers present were just academic people ; that was not the case.

In summarising, he would like to refer first to the challenge : Why should the production engineer be concerned with the financial aspect ? He thought that challenge could be disposed of by what he had already said about it. A production engineer would probably be the head salesman, a production engineer would probably be the managing director, and a production engineer might be sitting on the board.

The next question raised was that of market research. He thought that all production engineers realised how difficult this could be, but many firms were carrying out market research in order to find out whether their commodities would sell not only at home but abroad.

They were collecting together the essential material, and, indeed, it was a very difficult job, because after all the customer who was often very fickle, was always right.

With regard to the rate of getting into production and the question of holding meetings to find out the progress of the various stages, of course, such meetings were held, but, even so, there was still the problem : "Can we be ready to start in time?" There might be some delay due to a press tool or some fixture. All such things came into the question and had to be watched very carefully.

He agreed with standardisation of the product and of tooling, and he was of the opinion that Mr. Elsdon, who had brought forward that subject, had given the members food for thought.

The question of the large and the small company, although very interesting, was outside the scope of the present discussion. He thought the Council might consider it as a subject for discussion in the near future.

As to the question of educating the public, that could be done by advertising, but this needed a great deal of money and before it could be undertaken a firm had to be successful in selling. Some people could be educated easily, but, taking a cross-section through the British public, he did not think they were ready to accept another man's word without searching deep down into the question themselves. The education of the public was a very interesting subject and should be considered again later.

Then came the question of the designer and market research. Did the designer co-operate with the salesman? In the case of his own firm, when a thing was first designed they found out whether it was likely to be attractive to the public and market research was carried out to see how many could be sold. Furthermore, during the design and development period production engineers were on a panel studying the job, and even when the design was finally made it was put before another panel of production engineers, who tore it to pieces to see that the article was designed in such a way that ease of production and ease of tooling came into the picture.

With regard to production research, he was afraid that that had been neglected in the past. Three years ago he had established in his firm a small research unit to carry out production research as distinct from fundamental research. It was the method used to study the methods of other people, and he had found it of very great assistance. Although it was expensive, he thought that considerable dividends were being obtained from it.

The after-sales service was important, and he thought that most people who supplied the public in a big way had such a service.

Mr. Silver had suggested that there was a lack of speculation on the part of firms, that they started in a small way and increased

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their production afterwards. He supposed that was true. Some people when they wanted to bathe put one foot in first to see whether the water was very cold, and if it was they did not go into it, but if the water was warm they put the other foot in and eventually went right in. He thought that running a firm was very much like that.

The question of the efficiency of directors was a very interesting one to him, but it should be realised that a director had to be advised by his specialists. He was a representative of the shareholders. He was between the shareholders and the job. Directors did not always have specialised knowledge of the product that was being considered and they worked entirely on the advice received from the experts in the various sections of the works.

He wished to thank all the speakers for their contributions to the discussion.

The meeting concluded with a vote of thanks to the Chairman.

DISCUSSION GROUP 3.

**YOUTH IN ENGINEERING :  
YOUTH IN INDUSTRY.**

Chairman : E. W. HANCOCK, M.B.E., M.I.P.E.

The Chairman : It is my duty to-day to introduce two subjects for discussion. I believe the best way to deal with this is firstly to introduce what I consider to be the most important points to be discussed, and then to summarise the points as they have been discussed, giving my own particular views.

To this end, I submit a series of questions, with an explanation for raising them so that you will have an objective to aim at during the discussion period.

*1. What do we mean by Youth ?*

When does Youth start and finish in terms of age ? Is it from 16 to 21, or from 5 to 18 ?

What are the periods of change from the raw material to the material completed for application, i.e., from babyhood to a qualified engineer ? Does this go in cycles of 7 years, or are the significant ages 13, 16, 18 and 21 ?

The above are important as an essential background in studying this whole question of " Youth in Industry " and " Youth in Engineering. "

*2. How should a Youth be introduced to Industry and Engineering ?*

How early should a youth begin to have either vocational training or stimulus ? We know that fond parents are inclined to set a target as high as possible—very often to the detriment of their own child, in that the words " Success " and " Failure " are referred to at a time when a boy is not able to understand their full significance.

Does the mere passing of an examination mean anything except a youth's ability to absorb information and retain it for a short examination period, i.e., cramming ?

What are the correct examinations in life ? We know that examinations are important, as certain specialised knowledge must be acquired and a tendency towards certain specific subjects can be watched very early in a boy's scholastic training.

Another important point which needs much wider discussion is—what has Industry and Engineering to offer Youth as a career ? Is it just a last resort after a boy has failed in attempting to reach

other professional standards, or is it accepted by our educational authorities as being equal in status and importance to the country as a whole, as any of the other learned professions?

When I speak of entering Industry and Engineering, I speak of this in its widest sense, and not in the sense of Youth just acquiring an engineering degree.

I believe that there is still a missing link leading to an engineering degree for those students who have come up the "hard way", namely, through the medium of apprenticeships in conjunction with the Technical Colleges Higher National Certificate Courses.

The acquiring of an engineering degree may still leave much to be desired by Industry from a student who may have had insufficient training and/or experience in the application of his scientific knowledge, whereas the student who has come through an apprenticeship course and has achieved the Higher National Certificate, has gone a long way on the application side of his training, and I submit he should, therefore, be able to carry on his studies leading to an engineering degree. The Industrial Matriculation does not fully cover this point, and I think the subject is worthy of a short discussion.

Surely the profession of Management is just as vital to the nation as any other, but is this particular profession sufficiently clearly defined and understood by our educational authorities to enable vocational guidance to be instilled early enough in a youth's career to:

- (a) Teach one human being to be complementary to the whole, and
- (b) Develop natural attributes, thus guiding towards acceptable leadership.

### *3. How should Industry and Engineering take care of Youth?*

Should the responsibility be left entirely to Industry or should it be shared with the educational authorities?

To-day it is the normal practice of most engineering concerns to work very closely with the Technical Colleges, and most apprenticeship schemes are to a pattern which is acceptable to Industry, Technical Colleges and Technical Institutions, and there is a much clearer picture to present to the parents of a youth's career in engineering.

Does this apply, however, throughout Industry as a whole?

How much further should the curriculum of a youth's training in engineering be developed away from the practical and towards the scholastic? Is there a danger for the youth in engineering if he is expected to acquire too high a general scholastic knowledge as against purely technical and practical knowledge and experience?

Do we feel that already we have set too hard a task for youth in

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engineering, as a study of the time required by a youth to reach certain standards will indicate that there is very little leisure available at certain periods of the year, and therefore, can we "cram" any more of the purely scholastic type of knowledge into the youth who is training for the engineering profession?

We are well aware of the encouragement given to the "bright boys", but are we satisfied we give enough attention to the "not-so-bright boys", as surely it should be our aim to raise the general standard rather than to have too wide a gap between the "good" and the "not-so-good"?

With regard to youth in Industry generally, that is youth which is not necessarily aiming for any high technical standards, are we satisfied that Industry is giving sufficient attention to this category, i.e., those who are not apprenticed or registered in any way?

If it is thought that more should be done, then, in what direction should this come and who will shoulder the additional financial burden? Is it felt that this should be shared between Industry and the educational authorities, and if so, how far should this interest go in developing the position?

Bearing in mind that, for example, skilled craftsmen and practical technicians are required more than ever to-day, is it thought that some secondary form of apprenticeship or registration should be encouraged, having the maximum focus on the practical side and the minimum on the theoretical and scholastic side?

*4. What opportunities do Industry and Engineering offer to qualified Youth?*

Are we satisfied that Industry itself has indicated a clearly defined specification of its requirements of the future so that all those interested in this subject can shape the training to that end? For example, has Industry yet clearly defined the future qualifications of foremanship, bearing in mind the many and rapid developments that are taking place in Industry in order that we, as a nation, should be competitive?

If it is felt that this question has been given attention in the engineering world, has it been given equal attention in Industry as a whole?

The work of the Institution of Production Engineers and its educational bias is but an indication of the interest which the engineering profession has been, and is, taking in this question, and a study of the activities of this Institution may well be regarded as a good example if applied in a wider sense throughout the country.

*5. What has Youth itself to say on the subject-matter under discussion?*

Is there anything wrong with Youth? Here I must immediately give my own view, which is that there is nothing whatsoever wrong

with Youth as such. Youth, to my mind, is a condition of years only, with raw material which can be fashioned by encouragement, training and kindly assistance, to reach a standard of understanding of life, and this is entirely the responsibility of the adults.

It is frequently said that the Youth of to-day is not what it was and my answer to this is "Rubbish". I quote as one example the Battle of Britain, although there are many other examples indicating that with proper training and an inspiration of purpose, Youth is as good to-day as ever it was.

What are the healthy aspirations and ambitions of Youth? Right from early childhood Youth is brought up on the idea that the Prince married the Princess and they all lived happily ever afterwards, and this might be said of a youth who feels that by achieving an engineering degree, he will live happily ever afterwards. Early Youth is naturally inclined to think more of the goal than the means to reach the goal, and somehow or other we have to find a way of making the "means" as interesting and inspiring as the "end".

How far does Industry interest itself in this aspect of the case in helping Youth to appreciate the purpose of things? Is there more that can be done, not by preaching, but by inspired action, to help Youth through its difficult periods of development within the framework of Industry? How best can Industry help to develop the best in Youth?

There are many opportunities offered by the Technical Institutions for Graduate Members to find their voices and thus accelerate their acquirement of knowledge.

Also on this question I believe that there is an opportunity either for the Industry or for the Technical Institutions to grant scholarships to youths, permitting them to visit other industrial nations, such as the U.S.A., and see for themselves some of the developments in their particular line of interest.

The above points are placed on a broad basis so as to widen the discussion on points of principle, as the purpose of my introduction is an endeavour to stimulate the right type of interest in the subject under review.

This subject is now open for general discussion.

Mr. T. B. Worth (Education Officer) said that much thought was now being given to the 'change ages' or the 'vocation ages' concerned in the training of youth. He wished to suggest, speaking from his own experience, that the age of 11 plus was too early an age for selection of any kind and that 13 was one of the major change ages in a boy's or a girl's life. He also thought, again speaking from his experience with students in several technical colleges, that at the age of 18 the young engineer began to be aware not only of the technicalities of his work but also of the wider issues

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concerning personal and human relations, but that did not develop for several years, and he therefore thought that all the training in the humanities and the human relations should be deferred till the later years.

He felt that in the training far too little attention was paid to group reactions. A student went into a college and was taught the technicalities and the sciences and he did experimental work and project work, but his teachers did not pay nearly enough attention to his reactions with his fellow students, by which they could attempt to judge his probable reactions when he became a member of a social group later on.

He agreed with the Chairman that an attempt should be made to obtain a bridge from the Higher National Certificate to a degree. There was first-class material going through the National Certificate Courses, and he thought that though the academic and practical training in such schemes could be criticised as lacking continuity in some respects, he believed that parallel progress made up for that in many ways.

With regard to what might be termed the third group, which consisted of those people who did not serve a recognised apprenticeship and who did not go through a Higher National Certificate course or a City and Guilds course, the Regional Councils were considering a recommendation that there should be set up a new type of course which was composed almost entirely of practical work and containing the minimum of science. He was not suggesting that the people in question were not equal members of a social group ; they were, but due to their make-up they had not absorbed a high degree of scientific knowledge. That problem was now being discussed. He was interested in the Graduates' Sections being developed, in such a way as to allow the graduates to express their opinions on all sorts of questions, because information should always flow in both directions. Those who arranged the training wanted to know the students' reaction to the various courses, just as the students wanted to know what those who arranged the training felt that they could do to help them.

With regard to youth in industry, he had been associated with a group of experiments in which boys from a junior technical school (now a technical high school) had been allowed to move to a senior college and spend three months in their final year, at the age of 13 plus, in the various departments of that college. He fully appreciated that that did not impart an industrial background, but it enabled the boys to see the equipment used in a particular industry, such as hosiery, boots and shoes, engineering, etc., and they gained some impression of the type of work involved in that industry. If that could be extended and allied with visits to factories, the initiation period would be far less difficult than it was now.

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Mr. A. Oppenheimer (London) said that he particularly appreciated the Chairman's remarks with regard to contact with the United States ; he recently had an opportunity of spending six months there and he thought that what the Chairman had said was very important.

With regard to the question of youth, he thought one approach would be to say that a youth in industry was a person who had far more initiative and drive than experience. Owing to lack of experience, a young person was sometimes not quite sure whether he was driving in the right direction. On the other hand, the older people in industry had very much more experience and responsibility than the younger, but they seldom had as much time to concentrate on one particular thing. He had been greatly impressed by the tendency at the present Convention for people who, like Mr. Hancock, had gone through a very long and arduous process of acquiring experience to stress their willingness to pass on that experience to younger people. He believed that particular tendency was one of the most important aspects of the Convention. Were the people in industry who had experience and responsibility going to share their experience with those who lacked it?

It was often said that in the old days it was not an easy thing to rise from the shop floor into management, that it had been necessary to attend week-end courses and evening courses, and that nowadays, with the State scholarship, progress from the shop floor to management was being made too easy. It was said that those who had to follow the hard way and go to night school were likely to be better than those who went to day college. He wondered whether, even with the State scholarship scheme, it would not still be the case that those who were the most suitable would stand out as the best. He thought that the *whole* of education should be made easier, in the hope that the best material would still stand out.

In America engineering education in some of the larger organisations was given by means of co-operative studentships. In General Motors, for instance, two people would exchange places in the factory and the university. One might stay in the factory for eight weeks and then change over with his opposite number in the university. Mr. Oppenheimer thought that more attention should be given to that particular type of training.

His chief point was that an effort should be made to find a means by which experienced and responsible managers could pass on their experience to younger people. How could arrangements be made so that people like Mr. Hancock could work with younger people, so that those younger people would drive in the right and not in the wrong direction ? He suggested that the best means of approach was the round-table conference. When the management wanted to start a new project, for example, it should be considered by a

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committee of which half the members were young people, and in that way those who lacked experience would obtain it at the earliest possible moment. He did not say that there should be a greater tendency to place young people in responsible positions in industry, as in America. He thought that young people should be trained to do responsible jobs and given experience in doing those jobs; then they would ultimately rise to more responsible positions.

The Chairman, referring to Mr. Worth's remarks on observing the reactions of students in industry, said that there had been a considerable number of experiments on group reactions and the Americans had used many devices for the purpose. One which had interested him very much was an experiment in America in which the reactions of a group of youths were checked, where photographs were taken and the atmosphere was measured. First there was a democratic atmosphere and a democratic group was given a specific problem to solve, then the atmosphere was changed to an autocratic one and then to an atmosphere of *laissez faire*, the same problems being considered in the different atmospheres. Some very interesting information had been obtained from this experiment, and from that had come the study of human beings similar to bird-watching, in other words, the study of habits. It would be found, for instance, that if the members of the present meeting drifted into the adjoining room they would form themselves into groups of about nine people. That was called spontaneous grouping, and it would be found that the first spontaneous tendency would be for them to talk about the subject which had just been under discussion.

With regard to the question of selection, to which Mr. Worth had referred, he himself was a great believer in negative tests, particularly for people under 17 years of age. He had studied in Germany for a time, and one of the tests which he had applied for many years originated in that country. In that test a number of small pieces of metal were given to a boy and he was told to put them together so that they made a square, and he was given a drawing of the square. The pieces of metal were so devised that however they were put together they could not be made to form a square. The object of the experiment was to test the reaction of the boy in adversity. It was no use in the case of the very bright boy, who would say: "I have put these pieces of metal in all possible positions, and they will not make a square"; a more difficult test was required for him. There was another type of boy who either burst into tears or became surly because he could not form a square, and then there was the grand little fellow who, after he had been trying for about six hours, was still smiling and said: "It will be all right, sir; I will get it soon." That was the boy whom he took for training, because that type of boy had something which would build up. He had found cases in which a very smart boy, when given a most

ingenious mechanical device and told to find out how it worked—an almost impossible feat—had become surly because he could not do it ; in other words, he was quite a bright lad until he met with adversity. Personally he believed that reactions were important, and he thought that Mr. Worth's chief work in selecting good material for leaders was to obtain the reactions of youth to adversity as early as possible. If a lad's reactions to adversity were good he would probably develop well and have the basic material for a good leader.

He was very interested in what Mr. Oppenheimer had said, but he thought it would be wrong to make life any easier for the youth of to-day than it had been for the youth of his own time. It should be to a higher standard but not easier. Bunkers were put on golf courses to make the game more difficult and more interesting, and the 100 metres race was being reduced in time each year, i.e., raising the standard. Greater intelligence was needed in industry, because if this country's industry was to hold its rightful position internationally, its ability and status must be raised.

He agreed that young people in America appeared to hold more senior posts than young people held in this country, but his impression was that when they were 50 or 55 they appeared to be more exhausted than their British counterparts. He thought that the American practice in this respect was wrong. People should not use up all their energy too quickly, as experience gained over years was of equal value. They could not hand on the torch so well to the coming generation if they used up the wick too quickly. He therefore believed that the system in this country was better, whereby a longer life was made happier. Incidentally, English people as individuals worked just as hard as Americans and perhaps a little harder. They were working very hard, and the youth of this country must not feel that the American tempo was any greater than the tempo here. He believed, however, that the Americans had a greater ability for getting everybody together and talking over a project before it started. The youth in America who criticised a policy that was put forward was brought to the front and if his point was sound he was promoted. In this country it sometimes happened that a youth who made a suggestion was accused of being disloyal. The youth in industry should be encouraged to speak up and speak clearly, and he believed that the adult would then respond.

Mr. G. M. Saul-Brown (London) said that he was particularly interested in the training of youth, as he was more or less responsible for well over one thousand, ranging from boys who had been to Eton to boys who came from the East End, so he had a cross-section of the youth community of this country. He agreed with the Chairman that in the main youth was as sound to-day as it had ever been.

Referring to some of the points raised by the Chairman, he would suggest that vocational training should not start until the age of 15½ to 16, and he would press for a cultural training up to that age. He had seen boys in industry who had come from the junior technical schools and whose training (he said this with all due respect to the technical teachers) had been somewhat narrow. They were good lads ; they went through their training to the Higher National Certificate, but they had then reached their ceiling, because their education had not been sufficiently broad. On the other hand, he had seen boys from public schools and grammar schools come into industry with a better background training in cultural subjects, take the Higher National Certificate and go on to take a degree. Very often there was no limit to their training, but there was a limit to the training of the lad who had been directed into a somewhat narrow vocational training at the very early age of 13. He thought that the new Education Act was a godsend to industry in that it established multi-lateral schools, where there was not a complete segregation of children into technical schools, grammar schools and secondary modern schools. In the multi-lateral school at certain ages (13 was suggested, but it might be 14 or up to 15) a boy who started in the technical school and was found better fitted for the grammar school could be transferred there, where his cultural training would have a bias on the technical side, so that there would not be a big change over from the technical to the purely cultural. On the other hand, many of the boys in the grammar schools were ill suited to go on to the professions for which they were destined, and they were automatically transferred to the technical school and would do better as technicians than in the professions of law, medicine and so on.

He felt many difficulties arose in industry because a man was not in the job for which he was best suited. That might be due to his training, and that raised again the question of the early selection. Were the boys selected properly ? How were they selected ? What qualities were looked for in a boy when he came into industry ? What should be his line of training when he came into industry ? What oversight was given to the boy in his training ? If a mistake was made in the placing of a boy and he was found to be ill-suited to his job, was there anyone in a company to say the boy was to be taken away from that particular type of training and given another type ? If the latter was the case, he felt sure that there would be fewer misfits in industry than there were to-day.

Mr. Hancock had spoken that morning about the human side. Was sufficient attention paid to that in the selection ? Every boy who came into industry was a human being and he should therefore be treated as a human being right through his apprenticeship and his post-graduate work.

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Lads in Mr. Saul-Brown's firm went in for all types of degrees and qualifications, and he was concerned whether lads of the right type were entering the great profession of the production engineer. He would like to give the meeting an example of what happened in that connection. A boy might come to his firm wishing to be a designer ; he knew that a certain qualification was expected, and after a year or two he found that mathematics or the sciences were beyond his reach and he said : "Can I change over to an easier line of study ?" When asked what he would like to do, he might say: "I should like to be a production engineer." Personally he maintained that if a boy had not the qualifications to become a designer he might not have the qualifications to become a good production engineer. What should be done with that lad ? Should he be allowed to become a production engineer and probably a misfit in industry ?

The early selection was therefore a vital matter, and he would stress that people in industry should be given guidance in early selection with regard to the qualities to look for in a potential production engineer. Headmasters were very helpful in their confidential reports to industrial firms, and he would especially emphasise the importance of going on to the sports field or into the playground and seeing the boys there as well as in the classroom.

Colonel C. Warren-Boulton (Calcutta) said that the problem before the meeting was much more acute in India than it was in this country. A Section of the Institution had recently been established in Calcutta, and he was happy to say that it was making good progress.

The Chairman's list of questions was somewhat alarming, and he would be glad if members could obtain copies of them, as it would help members overseas if they could go through them at leisure.

With regard to the question of examinations, to which the Chairman had referred, in India the passing of examinations was no guarantee of a boy's qualifications. He had been a member of the Examination Board of the Institution of Mechanical Engineers in India, and he remembered one case in which an Indian boy had answered a question word for word from the textbook. He failed in the examination and his father pleaded for a re-examination for him. The boy was brought in, and he could repeat practically the whole textbook from memory. He had no qualifications outside a good memory.

Speaking from 37 years' experience in India, he thought the missing link to which the Chairman had referred was that boys who wished to go into engineering should be taken from the high school into the works for two years, from the age of 16 to 18, and at the age of 18 they could make up their minds whether they were

going to a university for their theoretical training. It was very important that they should have some practical training and be able to mix with their fellow men. In the case of well-to-do or middle-class families in India, the boy on leaving school went straight to a university, where the atmosphere was the same. If a boy went into a works for two years, from 16 to 18, he learned to know his fellow men in the shop as he would never do in the university.

Many different systems had been devised. One, which he was glad to say had not emanated from India, was the scheme under which a large number of boys in India were sent to England or America for six months. He thought that was a very great mistake. If half the number had been sent for twelve months or, better still, a quarter of the number for two years, some results might have been achieved.

He agreed that youth was a condition and that youth to-day was just as good as it had ever been. To those who said that youth was not as good as it used to be, he would give the reply given when it was said that *Punch* was not as good as it used to be : " Well, it never was."

He had the privilege of being married to an American lady and he spent a great deal of his time in America. He was connected with the majority of the large American as well as the British machine tool firms. He could vouch for the fact that there was no difference whatsoever between a good American and a good Britisher. A Britisher who went to the United States was treated by the Americans as one of themselves. He also agreed with the Chairman that people in this country worked just as hard as the Americans and perhaps harder, and they achieved equally good results.

At the present meeting there had been a tendency to place all the responsibility upon the teachers. He had been connected with technical schools in India for many years, and he thought that the lack of technical schools in that country to-day was one of the greatest mistakes that the British had made in India. They had paid far too much attention to the establishment of high schools and hundreds of universities in India, instead of putting boys into technical schools, so that some industrialisation could have been put into operation.

He thought that some of the responsibility should be put upon the parents. He had recently been told that a certain schoolmaster was accustomed to say to any boy who was a little dull : " Well, you will end up as a dustman." Why should not the boy be a dustman ? If the father was a dustman the boy should be told : " You want to be a better dustman than your father." He held very strong views on that point. If all boys became engineers, what would happen to the utility services ?

Mr. Mansergh Shaw (Australia) said that whereas India had very few technical schools and hundreds of universities, Australia had hundreds of technical schools and only six universities. As a result of the experience of some of those technical schools, he would like to support Mr. Worth on the question of the age of entry to technical schools. At the junior technical schools in Victoria the age of entry of students was between 10 and 11, which was a very early age for a boy to start his technical training. The technical schools themselves were very perturbed about this, because they turned out people who were in great demand by the industrialists but who were not full citizens or cultured people. He therefore agreed that the age of 15 to 16 was the right age for a boy to start his technical training.

As a member of the staff of a university, Mr. Shaw did not agree with the contention that a degree was the be-all and end-all of an engineer's training. The students at his university were always told that when they had got a degree they were still not engineers, that they must go into industry and learn, and they were advised to get experience overseas whenever possible. At the present moment five of the students from Melbourne University were starting on a minimum of two years' training in works in this country. Very few works in this country, however, had the enterprise to send any of their people to Australia, and he feared that, as a result, a valuable opportunity was being missed which would soon be gone for ever.

With regard to the question of practical training for a man with a degree, when, where and for how long should they get that training? He had just said that engineering students in Melbourne had been sent to this country for a minimum of two years' training in works, and it might interest the meeting to know that in the University of Zurich, Switzerland, it was a statutory requirement that an engineering student must have spent twelve months in a workshop before he went to the University. In Sydney University the students went to a workshop for twelve months between their third and fourth years at the University. He would like to hear the opinions of some of those present at the meeting on the best time for the practical training to be taken, for the students to rub off their square corners and meet their fellow men. It was more important for them to do that than to learn how to use a lathe, a hammer or a chisel.

A good deal of criticism had been levelled at the examination system, but he did not think it was so bad as many people imagined. The Chairman had said that the reaction of a boy in adversity was very important. It was a question of what a boy would do in a

crisis, and an examination was a crisis and a good guide as to what the student would do in adversity. Fortunately the classes in universities were small, and the teachers generally knew all their students very well. Examinations must always be the final arbiter. A good student would always pass and a poor student would always fail, but in doubtful cases the teacher's knowledge of the student during the year was a very great help.

Mr. J. R. Ratcliff (Eastern Counties) said he thought the age at which a student should be transferred from one stage to another depended very much on the individual. All students were not ready for the same change over at the same time. They reacted differently to various stimuli.

The college course which he had taken had been four years, of which fourteen months—seven months in the second year and seven months in the third year—had been spent in a works. The students had been reported on at the end of each period of seven months, just as if they were working in the class room, and a student who did not qualify in his works experience had not been encouraged to continue the course. At the time when he had taken the course there had been a number of ex-Service men taking it, with boys from public schools at 18 and boys from secondary schools at 16. Heads of departments had said they could not say that one age group would be ready for final entry into industry before another. At the same time there had been at the college a very strong and flourishing night section, where men who were employed in industry during the day worked to an honours degree standard in seven years of night work. The day students had shared their Engineering Society with these men and had been encouraged to mix with them and have discussions with them, but they had found it difficult to appreciate the point of view of men who were working in the shop during the day and studying for their degrees by night work.

They had been told when qualifying that a degree was simply a "licence to start learning" and that the most important thing for the first two years was to conceal it. On entering industry he had worked with men in the firm who were working there during the day and studying for their degrees by night work, and since then he had had such men as assistants. His feeling was that for purely technical or for specialised administrative jobs there was no one to beat a man who had gone from a secondary school (or a technical school, as it might be nowadays) into industry and had obtained his degree by evening work. He would, probably however, be lacking in the education in the humanities that he would obtain between the ages of 15 and 18 at a good secondary school, and he would never have time or receptiveness to get that education afterwards. If between the ages of 14 and 18 a boy had acquired valuable practical experience on the floor of the shop it would

enable him to apply his technical training very much better, but he would have sacrificed something on the cultural side which might ultimately debar him from the highest administrative positions.

Mr. W. N. Aspinall (Wolverhampton) said that he was one of the younger members of the Institution and therefore could not compare the youth of the present time with the youth of the previous generation, but in his comparatively short experience he had both taught in technical colleges and occupied an administrative position in a factory, and he had noticed a lamentable lack of people taking up a trade rather than a profession. Possibly that was due to the fact that the choice nowadays for a boy leaving school at the age of 15 was to go into a mass production factory, where he could earn about £10 a week almost at once, as a semi-skilled operative, or to take a technical course in order to become a designer, a manager or a production engineer. It seemed that there was a sad lack of encouragement for young men to take up trades. There was a financial disadvantage, in that a young man taking up a trade had to spend five years of his life at a low rate of pay. He would like to hear the Chairman's comments on raising the status of the tradesman in order to attract the apprentice who was going to train for a trade.

With regard to cultural training being carried on until the age of 16 or thereabouts, he did not think it ought to stop then. Surely the age of 16 or 17 was the age when a boy should begin to receive training in citizenship, instruction in the operation of local and national government, and similar subjects. That was one of the things that were lacking in the present educational system.

Mr. K. H. Buckley (Wolverhampton) said that he claimed to be still a youth, although he would not be so called under the Chairman's definition. He thought that one of the troubles in the education of the young engineer was that there was a tendency to regard youth as ceasing at the age of 21.

With regard to the four ages at which the Chairman had suggested that changes occurred in a lad, the only physical changes were biological ones. His character was influenced to a large extent by those biological changes and also by his environment, and it was impossible to name four ages at which all youths would change.

With regard to the question of university and technical college training, were not two different products being produced by those two different forms of training? Mr. Ratcliff had inclined towards that view when he said that a man trained at a technical college by night work lost some cultural training. That was unavoidable; a lad could not be expected to work eight hours a day in a shop and go to night school for technical training and still have time for cultural education. After a lad had finished his Higher National Certificate course could he take up cultural subjects?

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On the question of a lad going into the shops before he went to a university, Mr. Buckley was sure that the Chairman and many other members present had seen in the past few years a number of young men who had come back from the Services and tried to start their studies again. He himself had met many of them and he knew that they had had a very hard time.

There were three different aspects of the training of an engineer. The first was technical training, the second was craft training and the third was character training. Technical training could be done and was done at the university. Craft training unfortunately had not been done at the university when he was there during the war, but it could be done there. All the universities could have their own workshops and could teach crafts during the university course. Character training a lad must obtain in the works through association with other men of entirely different outlooks from his own, but in a four-year university course there was ample time for him to obtain some of that training during the vacations. He would then have acquired his technical training, his character training and some sort of craft training by the time that he left the university, and, according to some of the speakers, he would expect to drop straight into a nice job, but that, of course, was impossible. It was not only the idea of university-trained men. Every man in the shop at the moment wanted to get into the office and put on a collar and tie. What had to be done was to raise the status of the craftsman and the shop foreman, to make each man realise that he had his part to play, and to make the university man realise that he had to go down and grub about on the shop floor in his overalls after he had got his degree, and then perhaps in another five years he might be ready to take responsibility. The craftsman was playing an important part and it should not be his one ambition in life to get out of the shops and into the office.

The Chairman said that he was particularly interested in Mr. Buckley's observations. The meeting wanted to hear the views of the younger members and their ideas of frustration, real or imaginary. An imaginary feeling of frustration was just as real as a genuine complaint. He would like to give Mr. Buckley some encouragement on the question of age, and first he would point out that in his address he had not made statements but had asked questions. His definition of youth was this : "Age lives in the past ; youth lives in the future; and, as the future depends on the present, watch the present carefully!" So long as the people in this country remained young and continued to live in the future they were all right, but if they were going to be a lot of old mumblers, going about in bathchairs and saying : "Do you remember ?" they were finished. Youth was a state of mind just as much as it

was a matter of years, but was more generally associated with the number of years that a person had lived.

On the question of learning he believed that people never stopped learning, and he thought that was an important point to bear in mind. That was why he would ask again : What are the examinations in life ? They were not confined to school. They were going on all the time. There was an examination going on at the present moment in the meeting that he was addressing ; each brain in the room was examining and checking. He had met men, grand fellows, who very late in life had awakened to the realisation they had let something go. Perhaps they had led a selfish life, feeling that success depended on the acquiring of money or of possessions ; too late they had found that they were being partially ostracised, that they had not the genuine friendships which they wanted to have. Care should be taken not to leave the learning of important things until too late in life, and that was why he begged everybody to go on learning these things day by day.

With regard to the age at which a boy should obtain his practical training, a question which had been raised by Mr. Shaw, the Chairman believed that there was a middle course between what was known as the hard way and the easy way, and the late Dr. Wickenden had agreed with him on that. One of the points that he would make in his summary of the discussion was that everyone was talking about the parallel type of training. It was a condition that the students must have practical experience. He thought that the very august authorities at the meeting agreed that there was a middle course. Neither the boys themselves nor their parents should be confused with all the varieties of methods. Production engineers should resolve that they, as practical men, would ask for a practical type of training with the correct admixture of theoretical training and a lead into the higher qualifications of University Degrees.

With regard to Mr. Saul-Brown's contention that vocational training should not start before the age of  $15\frac{1}{2}$  to 16, if the speaker was referring specifically to a particular specialised branch he would agree, but he was thinking more about the raw material and the best guidance that could be given, because it was a shocking thing for a boy to be set a task in his training for a designer, for instance, and for him to have to come back and say : "I am not going to be able to do this. What else can I do ?" If a boy, particularly a sensitive one (boys were much more sensitive than they appeared), felt early in life that he was a failure, he might not be able to get over it. So long as the adversity test was done in a simple way all was well, but *real* adversity could sometimes retard a sensitive boy and give him an inferiority complex. He believed that tests which were important in the

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selection of human material for training could be applied very much earlier than the age of 16.

In conclusion, he thought the mere fact that so many people had attended a meeting to listen to a discussion on the question of youth in industry and youth in engineering was a good sign. It was for youth to take advantage of this encouragement. The old "greybeards" in the profession were handing on to the young people all they could as quickly as the young people could pick it up, but they must not give them "indigestion." The young people must realise that they could not learn everything but must let some things go ; in other words, if they wanted to play the piano but had to learn more important things they might have, as he had, to listen to somebody else playing it.

Finally, however lowly were the tasks of human beings in industry, they should still be made to feel that they played an important part in that industry.

The meeting concluded with a vote of thanks to the Chairman.

DISCUSSION GROUP 4.

**THE ECONOMICS OF QUALITY  
AND ACCURACY**

Chairman : E. P. EDWARDS, M.I.P.E.

Mr. B. H. Dyson (London), introducing the Chairman, said that they could have no more important subject to consider than the Economics of Quality and Accuracy. As everybody was aware, British trade was built up on the quality of its products, and it had often been said of British goods that the quality remained long after the price was forgotten. Price was, of course, an important factor, and quality and accuracy had to be tied up with the price at which the product was to be sold.

In many organisations, the question of who really determined quality was never solved, and the product went down the line from the tool designer to the inspector, through the foreman and the setter all having their own ideas of the quality standard.

No one was better qualified to lead the discussion than Mr. E. P. Edwards, who was a Member of Council of the Institution and who had held many positions in charge of production as Works Manager. At present he was Sales Manager of the Lapointe Machine Tool Company, a company of repute regarding its own products and incidentally those products determined the quality of components in many factories. It was, he thought, unique that a man who had at one time been responsible for the quality of the product should now have the job of sales manager and should see what a difference quality made in selling.

The Chairman, after thanking Mr. Dyson for his opening remarks, said :

It is with some trepidation that I received through the Director and General Secretary the command of the Convention Committee to occupy the Chair at this Meeting, and to introduce the subject. This did not seem easy of practical approach, although I had no doubt as to its importance.

I hope therefore that what are intended to be purely introductory remarks will suffice to encourage a lively discussion before the meeting closes.

A long time has passed since Plato recorded that "education imparts an appreciation of quality", and it naturally follows therefore that lack of education encourages an acceptance of shoddy and apparently cheap material. I say apparently, because often the cheapest article judged by its prime cost may prove to be much the dearer in the long run.

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I propose to extract and somewhat rearrange the order of the operative words in the title of the discussion, and to consider them in the following sequence :—

1. Quality.
2. Accuracy.
3. Economics.

It appears to me that the first two are very closely linked because surely accuracy is a dimensional function of quality, and in engineering practice we cannot have the latter without a considerable proportion of the former. It seems, therefore, that quality and accuracy, for the purpose of this discussion, can be considered synonymous in relation to economics.

Taking the linked subjects of quality and accuracy, let us consider the fundamentals with which we are concerned :—

1. Thought.
2. Design.
3. Material.
4. Men.
5. Method.

These, when added together, will result in Performance.

It will no doubt be agreed that these headings are only conveniences, as they in turn are also interlinked. For instance, men and thought, or design and method.

### **Thought**

This is the process of constructive reasoning, and as premised by Plato requires a basis of education to ensure quality. In our sequence, it is necessarily the starting point, and must be fully exercised and of the highest quality before we can reach design.

### **Design**

The dictionary defines this as being to sketch, plan, pattern or scheme, and all or some of these are essential to the attainment of our object, and follow in sequence from our previous heading—thought.

### **Material**

Here is a word with many meanings. It can be material, wood, stuff or matter. It can mean something substantial or tangible, of the earth earthy, or of the senses rather than the spirit, but for whichever use we include it in our considerations, there can be no doubt that it must be linked with quality.

### **Men**

Here is probably our greatest intangible, and the one which calls for quality of the highest degree. The best thoughts, the

greatest plans, and the finest materials can be of little use unless coalesced by men of the highest quality, relative to their particular functions and attainments.

### Methods

By method we refer to systematic procedure, or orderly planning. Nothing slipshod or irregular can be envisaged, so that once more we imply quality.

The summation, therefore, of thought, design, material, men and method is performance, and thus the whole form a grand symphony, analogous to an orchestral presentation—the original conception resulting in musical script, reproduced on instruments of finest materials, played by competent men, and led by a maestro of superb intellect. Thus, in the musical sphere, we obtain a performance unexcelled, and likewise in our everyday applications we must follow the same logical sequence to obtain the highest achievement, and the most economic results.

### Economics

Again referring to the dictionary, we learn that this refers to the science and study of those general principles which govern the production and distribution of wealth. As Production Engineers we are perhaps more closely concerned with the principles governing production than those of distribution although the latter cannot be entirely overlooked, especially where exports—always very vital to us—are involved.

I have purposely dealt with the title subject up to this point in an abstract manner, with a view to leaving the more practical considerations to be brought out in discussion. We may for a few moments, however, consider the practical issues arising from the foregoing.

I have already premised that quality and accuracy are synonymous, especially in Production Engineering. Quality is of the utmost importance with regard to :

- (a) Individuals, either productive or managerial.
- (b) Materials for endurance.
- (c) Equipment—machines, tools and processes.
- (d) Presentation—either for Home or Export.

Again, quality is of vital importance nationally. The slogan "Made in Britain" should be no empty boast. There has unfortunately been evidence recently of some deterioration in standards, particularly with exports. While the reasons may be difficulties with material supplies, inadequate re-equipment of industry (this, by the way, could be a subject for a Convention in itself), or the psychological unconcern of executives and workers alike, arising

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directly from the effects of war, it must be our constant endeavour to re-establish high quality, always keeping in mind, however, that this cannot be "at any price".

The economics of quality and accuracy may be further summarised :

#### **Quality**

Design for ease of production without sacrificing essential features.  
Materials—ensuring their fitness and suitability for the purpose in view, but avoiding superfluity.

Men—the attention to proper grading, the necessity for inculcating a suitable educational background, the encouragement of craftsmanship and the fostering of an appreciation of quality.

#### **Accuracy**

Ensuring accurate assignment of tolerances with an adequate and balanced measurement technique; securing the general fitness of all components for the purpose intended; making certain of correct analysis to determine the right degree of inspection, and finally, quality supervision in all its aspects should be a direct individual functional responsibility, involving economic considerations to determine degrees of inspection. Where it is not possible, predetermined standards should be established, direct measurement thus precluding there being any question of "opinion only" being involved.

#### **Economics**

Within the limited time at our disposal I have attempted to sketch the dependence of economics on quality and accuracy, and to analyse some of the principles involved. On reconsidering the subject of the paper it became manifest that there were other methods of approach; if therefore I have succeeded in stimulating some thoughts on these, there is now an opportunity for a full and profitable discussion.

I thank you for according me a sympathetic and patient hearing, and now declare the meeting open.

Mr. E. G. Milner (London), opening the discussion, suggested that the question might be tackled along the following lines.

Firstly, there was the cost of an article from the manufacturer's point of view. The cost of the average article was surely made up of two parts: (1) the cost of manufacture to ensure complete fitness for its purpose; and (2) the cost which must be incurred to ensure eye and sales appeal—good line, balance and so forth.

From the consumer's point of view the buyer sought first of all an article priced competitively relative to quality; and second an article not too exorbitant to maintain after purchase. This

involved care in design so that service, spare parts and so on would not be too costly. Here came in a difference already touched upon in Group 1—the difference between the buying public in the United States and in Britain. He thought it was true—though perhaps it was an exaggeration—that in the States a woman would buy an egg whisk for thirty or forty cents, break it at the end of a year and go to the local store for another. In Britain, on the contrary, she would probably pay up to half a guinea for the same article and after ten years take it back to the local ironmonger for repair.

The first requirement with regard to design in this question of accuracy was to ensure that we allowed the widest possible tolerances. Too close tolerances added to production costs.

Mr. A. Johnstone (Nottingham) thought it essential to define the term "quality". Mr. Edwards had said articles should be of the highest quality; and again an article had to last a certain time. His own firm had boilers and engines that had been in use since the eighties: they were not efficient but they were such wonderful pieces of engineering that no one would scrap them.

He welcomed the suggestion that tolerances should be kept as wide as possible.

Mr. G. W. Wright (Western) expressed the view that the quality of a new project should be a matter for discussion between the Design Department, the Production Department and probably the Sales Department. He contended that if quantities were large enough and production big enough, it cost no more to make a really good class article than a shoddy one.

In many organisations quality and the economics of quality were not taken into consideration soon enough. A conference between the three departments he had named would result in an article which, though probably not of superb quality, was thoroughly serviceable, easy to sell and yielded a good return.

Mr. J. E. Baty (London) said he had once been called in by a large gas company in connection with gauging products. They had bought as many as a million of one article, taking a hundred thousand from one maker, ten thousand from another, twenty-five thousand elsewhere—all at different prices. The first thing he had done was to redesign certain parts and get out the necessary specifications. The buyer held up his hands in horror and thought the cost would be several times what he had been paying. In fact, in every case the product was cheaper than the lowest price he had previously paid. If a job was started properly it was just as easy to make a thing right as to make it wrong.

He did not altogether agree with Mr. Edwards that quality and

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accuracy were interchangeable. Accuracy referred to dimensional qualities only, whereas design and material also came into the question of quality.

One small point with regard to accuracy : many firms up and down the country put in elaborate equipment and proudly displayed their standards room. In a great many cases, however, such apparatus was absolutely unnecessary and was purely a luxury. It was possible to start with comparatively simple measuring equipment and make the finest quality stuff. These elaborate measuring laboratories were necessary only for the very large firms where sub-standards and gauges came in from many branches or departments and had to be kept up to scratch.

Mr. P. R. Elsdon (London) said he could support the plea for wider tolerances only within certain limits. Quality—and certainly accuracy—demanded interchangeability and interchangeability demanded closer tolerances. The plea should be for equipment which produced closer tolerances more cheaply, and, with reference to Mr. Baty's remarks, for measuring equipment which could check those tolerances more simply. That was perhaps more important than reducing tolerances. An article produced to a close tolerance which was interchangeable was more valuable than a handmade article, particularly in the present situation when large quantities of good quality articles had to be produced economically.

Mr. W. H. Logan (London) said that much had been heard about gauges, but he wondered what happened regarding quality when supplies were not available and perhaps the quality of the material received was not up to standard. In his experience schedules could not always be met during the week or month and the standard of quality was reduced in order that they might be fulfilled.

Mr. B. H. Dyson (London) suggested that some thoughts would be useful on how and by whom standards of quality were actually set.

Mr. G. W. Wright (Western) said that his company was concerned with aircraft and its standards were of the highest quality. There was a Quality Manager whose job it was to set the standards. He and his staff held a weekly design and quality meeting with the Design Department, at which any outstanding problems of tolerances on individual components, surface finish, hardness, and so on, were thrashed out.

With regard to his previous remarks to the effect that design, production and probably sales should get together at the outset of any project to decide on the economic quality to be achieved, he would add that to be on the safe side it was as well to fix the economic quality first and then try to do a little better.

The Chairman said Mr. Wright had touched on one point which was probably worth labouring. The Bristol Aeroplane Company

had, of course, to produce work of the highest quality—almost, one might say, irrespective of economic considerations, but that would not apply to the great majority of those present, and he would like to hear the other side of the picture. At this stage, he would like to ask Mr. Silver to read a paper by Mr. G. Daniell, a member of the London Section, who could not be present and had sent in his observations in writing.

Mr. Daniell said that in such discussion as this it was easy for the issues to become clouded by relatively unimportant details. The essence of the matter was to apprehend clearly the fundamental issues involved and this essentially demanded that terms should be defined.

Firstly, economics. The modern view generally accepted the definition of economics as "the science which studies human behaviour as a relationship between ends and means which have alternative uses." It was only necessary to say there that it did not refer to *any* kind of human behaviour, but concerned a particular aspect of behaviour in that it arose from scarcity.

Secondly, quality and accuracy might be taken together for they both expressed a function of measurement. Taking accuracy first, this might be defined as "a quantitative relation expressed by number having reference to a certain standard unit."

On the matter of quality, as such, they were upon very unfirm ground. The popular conception of quality was rather a function of measurement by implication. Any absolute concept of quality was elusive and scientifically regarded was unsatisfactory until it became related in some precise manner to a standard unit. The important point to note there was that as such a specific standard became more precisely established, so might quality and accuracy become more or less synonymous terms.

It was also interesting to note that all branches of production are, or were, at first merely qualitative and only in the most advanced fields was the attainment of a degree of precise mathematical law possible. Mathematical law was highly abstract and hypothetical ; it stated what would and must happen under clearly defined conditions, but it was generally impossible to secure those conditions unmixed with other interfering circumstances which modified the results.

As he had just stated, any human activity which bore the aspect of scarcity might be considered as within the scope of economic science. This relationship between ends and scarce means at once pointed to a fundamental fact that, in general, human wants were unlimited but human resources were quite definitely limited, whether in time, effort, or materials. From this, it followed that all economic choices or decisions were made from a number of alternatives and that the real value of any particular alternative

was any of the other alternatives which might have been chosen in its stead. Now a number of choices, if not most, might be considered in the light of the Marginal Utility Theory, and this was certainly the case when considering production and the problems to which it gives rise. This Theory emphasised the changes which took place in economic decisions at the margin. It was essentially a matter of "increments" and in a theoretically free market was the point at which supply and demand was equated by price.

The supply side might be regarded as mainly technical and the demand side as mainly economic. In general, the urgency of the demand would determine the price and the price would determine the output of producers. In addition, if the market was large enough, such as that for motor-cars, great economies were effected in supply by the application of quality and accuracy to large scale planned production. The criteria for the producer were, did increased accuracy avoid waste of time or material? Did accuracy make a more saleable product?

All successful administration consisted of the purposeful selection between alternative application of resources. The value of this selection was at its optimum when the administration applied a marginal utility to the various factors of production coincident with those of consumers in general. This optimum was a state of equilibrium which was never fully realised. A production engineer might know what was technically possible, but if consumers were willing to buy more and forego accuracy to the extent that it released resources to satisfy their wants, then the engineer would be unwise economically to insist upon his degree of accuracy.

All economics of quality and accuracy must be based on assumption of consumers' preferences and were tentatively derived from some direct experience. Ultimately then, both the desirability and the possibility, in the long run, of higher quality or greater accuracy was not determined by engineers, as such, but by these assumptions of human behaviour. Thus, such a discussion as the present one could only be carried on in relation to human needs and desires, which emphasised the necessity for an understanding of economic principles by production engineers. A production engineer in an administrative post had to be something more than an engineer. The modern world was far too complex to be understood even in part by reference to experiences and studies as workers in a branch of engineering.

Mr. B. H. Dyson (London) asked for comment on the economics of quality from the factory floor.

Mr. J. Silver (Birmingham) said his company was in the unique position of producing a motor-car which was above the average as it fell between the ordinary mass-produced car and the high-grade car. Anyone could produce a motor-car and the

modern motor-car was an excellent piece of workmanship. But there would always be the person who wanted something a little different—a better quality, a little more accuracy, a better performance. Consequently there were companies whose existence depended upon catering for that section of the public or that particular market. From this it could be seen that quality and accuracy in a product could come in stages. Quality should be looked upon not so much as being tied up with plus or minus in the dimension. Rather it was related to human requirements.

Mr. J. H. Hughes (Birmingham), referring to tolerances and interchangeability, said that much depended on the job and the limits set for it. Wide limits could still be coupled with interchangeability. With regard to standards, his company, during the war, had to achieve high standards. Their difficulty now was to get their inspectors to pass work of a lower standard in conformity with a different type of production.

The Chairman asked whether there were any comments on the vexed question of quality control.

Mr. E. A. Franklin (Western) said he could not quite agree with the idea of quality being sacrificed at the expense of quantity. Wartime experience proved that to achieve quantity there must be quality. Without it there could be no mass production. The only snag against quality, as far as he could see, was the time factor. In nine cases out of ten a programme had to be met at the expense of quality; and the concession thus made became the standard of the future until the customer commented on it.

To the three departments referred to by Mr. Wright should be added the Customer and the Inspection Department, the latter by virtue of considerable knowledge of setting standards from past experience. Having arrived at agreed standards, it was up to the Quality and Inspection Departments to see that they were maintained and satisfactory to the Customer. If higher quality should be required, cost should then be considered by the people concerned before Inspection could demand a better standard from production.

One thing which seemed to him to be fundamentally wrong was that instead of being regarded as a productive unit, the man employed to maintain quality was usually put down as an expensive luxury. In fact, he should be included as part of the production set-up.

Mr. H. S. Hull (London), responding to the invitation for comments from the factory floor, said that during his service in the Machine Tool Control he used to receive various requests for cutting tools, etc. which were often referred back to the customer as to why certain tolerances were required. In certain instances it was found that tools showing precision tolerances were required to produce holes whose only function was clearance.

Tolerance should start in the design office, and the designers should be practical men who knew what was really required of the tools or machines. There were too many designers who seized on standard tolerances such as Newalls, and applied them for every instance, whereas in many cases if the tolerances had been plus or minus one-sixteenth they would have been close enough. Further, very often a machine tool had a range far beyond the requirements of the work, with the result that costs were considerably increased. An instance in this connection is a case where a simplified form of lathe had been produced for £125 and was eminently satisfactory for the work to be done on it. Within a matter of a few years this had been "improved" at a cost of £625, and a simple sliding lathe had been converted into a tool room lathe.

With regard to consultations between the Design and Sales Department, he thought the customer should come in too. Production, Design and Sales had to consider whether the requirements of the customer could be met at the price he was prepared to pay.

As to quality, it was necessary to watch the Design Department. Otherwise someone would have an idea that efficiency would be increased by a change in the detail of design and before long an article estimated to cost 5s. would have risen in price to 15s. and even £5, making it impossible to sell in sufficient quantity. The sales-customer-design relationship was therefore very important, and it began in the drawing office who must know for which market the article had to be placed.

Mr. S. T. Pigott (Coventry) said it had been suggested that the inspector should follow up the job and find out the customer's reactions, and so on. In this way he would more or less determine the accuracy and quality required. Surely the Management Committee must establish the standard of accuracy and not allow the Inspection Department to do this and thus control the cost of production. Inspectors tended to be over-exacting and in many instances work had not been passed out for despatch because the accuracy did not come up to the standard set by themselves.

Mr. T. A. Westall (Preston) said no reference had as yet been made to a very important item—the inspection of gauges. Gauges might be perfectly designed, and the limits impose all that could be desired, yet by neglect of this very important item, all the care taken in design and setting of limits could be entirely liquidated.

In one case that came to his notice, the scrap produced from a shop order of 5,000 components a week was between 6% and 7%, due to the fact that a regular system of gauge inspection had not been instituted, and faulty (worn) gauges were being used.

By withdrawing all gauges periodically for replacement or reconditioning, as necessary, the scrap figure was reduced to .1% of production.

Mr. J. E. Baty (London) asked whether there were any comments on accuracy and quality in ball bearings, a subject most engineers regarded as important.

A member said the ball bearing was a very accurate and very crude component. Its method of manufacture, in the main, was crude, although the results were accurate.

To his mind the interesting point in regard to ball bearings and accuracy was the growing demand for tightening up the internal tolerance of a ball race. In the earlier days of ball races the thing which mattered was the outside diameter and the bore of the race, and possibly the squareness of the track. But recent experience had shown the necessity for tightening up the diameter of the ball in relation to the radius and form of the track. This had considerable bearing on the life of the ball part and the machine tool. Manufacturers had therefore had to consider the question of producing a track in a race which was in closer relationship to the ball diameter and that had meant a closer relationship to the ball race throughout. The ball race track was at present generally generated and not formed round, and in generating the radius of the form depended on the diameter of the track. A pitch diameter was established on the centre of the radius of the form and the whole diameter of the race was increased. Every increase in diameter increased the diameter of the form. There was therefore only one point at which the form was on a correct radius in relation to the overall diameter of the race. That factor was previously not taken fully into account but it was now found to be important. It meant that the generating diameter of the track both of the inner and outer race was held to a much closer tolerance than in the past.

Machines were now produced with automatic gauging systems where the inner race could be produced on a pretty close tolerance to the previously produced outer race. They were getting away from the selective assembly of ball races.

The Chairman said this seemed to bring out something he had touched upon in his notes and with which one speaker had disagreed—that quality and accuracy were to some extent synonymous. Here was a classical example. Everybody was aware of the controversy that had raged round ball races and roller bearings for a good many years. It was said that they should be produced more accurately, but he did not think anybody would suggest that it would be economic to produce ball races of the quality required in high-class machine tools for use in bicycles. Economics would come into both fields. It still did not alter his own opinion that quality and accuracy were synonymous in their own particular sphere. There was no reason why a good ball race

should not be produced for a bicycle as well as for a high-class machine tool. Both were ball races : both had their purpose. Had anyone any views on the economics involved ?

Mr. J. D. Scaife said he had had considerable experience in the manufacture of ball bearings, but he wanted to talk about another question, namely, who established a standard of quality ?

To determine standards of quality was the function of management in collaboration with the Sales Department after a study of the market. The function of a production engineer was to manufacture a given article to a pre-determined specification. It was fundamental to his duties to manufacture such articles as economically as possible.

Another point that came to his mind was that generation after generation seemed to deal with the problems in exactly the same way. Conversations and discussions were exactly the same throughout his 40 years' experience as a production engineer. Most of the discussion had been too detailed and an attempt should be made, in his view, to establish certain fundamentals. One of these was to determine where the function of a production engineer really lay. It was not in the question of design, unless—of course—in the design of the tools which he would use for his own purposes.

In regard to the old question whether it cost more to make more accurately he remembered an article on the increasing cost of fine accuracy with a chart showing an upgraded curve as accuracy went up or costs went down. He had thought it wrong then and later experience had confirmed that view. Increased accuracy had, in fact, gone towards bringing costs down.

He remembered in his early days, how automobile engines were run up by a 50 h.p. motor and stripped down time after time until eventually they were running on their own power. That was not the case today, and the fundamental reason was accurate machining. Everything was fine-tooled—the cylinder bore, the crank shaft, the camshaft bore—so that when the engine was assembled it ran immediately on its own power and did not even need to be run in. The present practice did not cost more ; it cost less. Herein lay one of the functions of the production engineer ; namely, continually to find better and better ways of bringing the cost down.

Ball bearing manufacture was another story. He had been concerned with ball bearing tolerances for over thirty years. What the production engineer was concerned with was the interchangeability of the various products. As far as internal construction was concerned that was not his business except in a ball bearing factory. His business was to pay his money and take his choice. He had a right, of course, to choose where to obtain his ball bearings and to insist that the manufacturers should see they were interchangeable, so that he could assemble them without some

of them being so tight that there was interference in the races. Tolerances were as wide today, in spite of the improvement in manufacturing and measurement facilities, as they had ever been. It was not a difficult matter for a general engineer with modern manufacturing facilities to work to closer tolerances, but ball bearing manufacturers had not yet reduced their tolerances. He would like to see something done about that by the Standards Committee.

Mr. A. Broadhurst (Manchester), referring to sheet metal and strip, said that before the war there had been some very fine specifications for silver finish and auto body steel sheets. The tolerances were just about half what they were at the present time. They had come down in the war to General Purpose Quality, known as the "G.P.Q." and to Cold Reduced General Purpose Quality and Cold Mangled Quality which could be taken or left. In press work one got sheets 8 or 10 thousandths up to nearly a Gauge down, giving a variation of 15 or 16 thousandths, and it was very difficult to make drawing tools to control these limits. A lot of shoddy work was due to raw material and not to manufacturing problems.

The rise in the cost of steel sheets and strip, it had to be admitted, had been kept down to a minimum, but tolerances and quality had deteriorated. The limits in width of strip had increased and consequently economics in manufacture were affected. For a very fine job a set of tools had to be made specially.

On surface finish of sheets where it was often necessary to do spot welding the surface was very difficult to maintain when it was painted with cellulose with a very fine finish on it, and the weals often showed badly on the surface. With the old silver finished and auto body sheets a very good surface was maintained on the sheet.

Again the material from which the sheets were made was not so good as in the past. It was difficult to get a set-up, and sheets out of the same batch gave quite different results. The British Standard Specifications really ought, in the interests of quality, to be brought back to the old standards as far as this class of material was concerned.

The Chairman said it was somewhat difficult to sum up a discussion so varied in scope.

One thing that had been made clear was that the economics of quality and accuracy very largely went back to people outside the control of the production engineer—design, sales, and perhaps more important than all, the customer, all of whom came into the picture.

Another point that had been brought out was the differing conceptions of quality and accuracy to be found in different parts of the world. The difference between the housewife in America

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and the housewife in Britain, to which reference had been made, for instance, was fundamental.

The next point was that the Inspection Department as such had little interest in sales resistance and costs. That was quite true, but inspection could not be abolished because of that.

One speaker had premised—he thought correctly—that the standard of quality was not entirely the responsibility of the production engineer. He had to manufacture articles to standards set by conditions outside his control.

Mr. Scaife had testified to the economy of accuracy in regard to the manufacture of motor-car engines and had compared present day manufacture with the past. That was an excellent example. Everybody knew that motor-car engines were now produced with finer tolerances at a lower cost.

The point raised with regard to sheet metal was very important. If basic material could not be obtained within the necessary tolerances, and with the requisite finish, the effect on accurate and often expensive press tools might be disastrous.

Another speaker had made a very important point on the saving or economy effected by the inspection of gauges. His illustration about the saving of scrap when gauges were tested showed how accuracy affected economics.

There appeared to be considerable divergence of view as to how far quality and accuracy were synonymous, but generally speaking it could be premised that within a given sphere there was a relationship between them which in turn affected economics.

The meeting closed with a vote of thanks to the Chairman.

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L.T.-GEN. SIR RONALD WEEKS,  
K.C.B., C.B.E., D.S.O., M.C., T.D.

Saturday, September 25th.

## BRITAIN'S INDUSTRIAL FUTURE

by Lt.-General Sir RONALD WEEKS, K.C.B., C.B.E.,  
D.S.O., M.C., T.D.

TOWN HALL, BOURNEMOUTH

*Lt.-Gen. Sir Ronald Weeks has had an exceptionally brilliant career both as an industrialist and as a soldier. He is well known to industrialists as Deputy Chairman of Vickers Ltd., and Chairman of the English Steel Corporation, Ltd. In addition he is a Director of Pilkington Bros., the Finance Corporation for Industry, Disabled Persons Employment Corporation Ltd., Metropolitan-Cammell Carriage & Waggon Co., Ltd., and Associated Electrical Industries, Ltd., Chairman of the National Advisory Council for Education in Industry and Commerce, Chairman of the British Scientific Instrument Research Association and a member of Council of the British Institute of Management.*

*He served with great distinction in the First World War, and in the Second World War was Director-General of Army Equipment, subsequently becoming Deputy Chief of the Imperial General Staff, which position he held until 1945.*

The President said he was very happy to introduce Sir Ronald Weeks, whose subject would be "Britain's Industrial Future," and hoped members would give him their undivided attention.

Sir Ronald said :

I should like to say how much I appreciate being asked to speak at this function which is, I believe, the first of its kind that the Institution has held. My task is to talk about Britain's industrial future, but I find that it is difficult to launch into the future unless I refer first to the past and present. If in so doing I repeat what a previous speaker has said, I hope you will forgive me.

Furthermore, although this is not a political platform, it is very difficult not to make references to what is present Government policy and I would like to say that whatever my criticism may be, it does not mean that I am not sympathetic with the difficult task this Government has had thrust upon it. All I would argue is that a Government with the largest majority in history should be expected to face its economic responsibilities and to deal with hard but unpalatable facts ; to tell us the truth and give us leadership even if unpopularity were increased thereby.

During the War we had a difficult task and the present one is equally difficult ; in the War we were unified under strong leadership, we worked as a team ; there the analogy ends. Therefore I make no apology for introducing such political matters as I

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consider relevant to the issue. Two weeks ago I listened to a powerful speech by Mr. Robert Menzies (late Prime Minister of Australia); he contrasted the picture of the country as he saw it in 1941 with what he sees today. He pointed out most vividly how disinterested we are as a country with a Commonwealth of Nations now as compared with 1941 and how essential it was to have unity.

Although the situation in which we now find ourselves and our future prospects are intimately connected with the chaos and destruction due to the war, other industrial changes have been going on which have a definite bearing. In 150 years the population has jumped from 10 million to nearly 50 million. Prior to the first World War we had built up a great industrial potential which served the world and we had also taken the risk of depending on imports for our food and on exports for the employment of our people.

Before World War I our visible and invisible exports exceeded our imports by one third and we had built up an enormous capital investment abroad. This situation gradually changed until by 1938 visible and invisible exports were not covering imports. You all know how the situation developed in the second World War; everything we possessed was thrown into the struggle without stint and without bargaining, so that we lost not only all our overseas capital assets, but ran up a large external debt, to which has now been added further loans.

As a nation which has persistently specialised in manufacture and is dependent on the markets of the world, we can never expect stability and repose. Even in the last century when we were pre-eminent we had our moments of doubt and were threatened industrially by other countries. Up to 1914, in spite of setbacks our history has been one of steady growth in production because we have been reasonably adaptable and have changed our manufactures to meet the situation. In spite of the decline in some of our staple industries like cotton, a number of new industries appeared and the value of production in 1939 was greater than in 1918. Output per man hour steadily increased.

The problem that we have got to resolve is whether, subject to certain assistance, e.g. temporary American aid, improvement in Colonial development and increase in home agricultural products, we can survive and once again attain the sort of economic balance we had in 1913, or whether we must visualise a completely new form.

Let me examine and try to enumerate briefly some of the outstanding points in our existing situation.

### **Overloading the Industrial Machine**

As I have already stated, we ran flat out during the War and as far as our production facilities were concerned many essential repairs were deferred, machines were over-worked and essential reconstruction was postponed.

Directly they were able to do so, all industrial firms tried to make good deficiencies and thereby created a demand for materials which could not be satisfied, coming as it did on top of an over-ambitious programme of social services which included building.

We all tried to do too much with too little and we naturally have had bottlenecks, frustration and many changes of plan, although it will be agreed that restrictions on capital expenditure were rightly imposed.

I have also referred to our loss of external assets, and although we may be balancing our budget internally, we have not got the necessary dollars or hard currencies to buy essential imports. The American Loan, and now Marshall Aid, have provided a breathing space.

It would be a good thing if we could look at ourselves from the American point of view. Are we really playing up to the great gesture that has been made by this country? It is all very well to say that their attitude is one of self interest; I do not believe it. I believe that America's own problems, ahead of her, are almost greater than ours, and in spite of that she has shown the greatness of being able to turn from an isolationist policy to the policy of restoring or hoping to restore the economics of Europe and the British Commonwealth for the benefit of humanity.

The obvious solution, which has been stressed in all quarters, was to increase our exports so as to pay for our imports; this export drive has been continuous and partially successful; the Chancellor gave us figures last week which are encouraging, but he does not hesitate to point out the necessity for continuous effort.

### **The Political Angle**

Politics inevitably play their part in the situation. The Labour Government with its steam roller majority has been able to introduce a programme based on ideological conceptions, and although many of the social policies (some of which were inherited) might be beneficial over a long period, there has been a tendency to do too much all at once, and the actual carrying out of parts of the programme has produced some chaotic results.

Various manifestos led many people to believe that "Utopia" was round the corner, with the dangerous implication that higher wages would be received for less work.

Some credence was given to the view that as a result of nationalisation, people would work "with a song in their hearts." I am

not trying to say that nationalisation of certain industries which serve the public is essentially impossible, but nationalisation must be judged on its merits in each case. It must be properly planned before it is applied, and so far the results are not convincing. The threat of it at this stage in certain industries, especially steel, is more than frightening though the Steel Authorities have shown in almost amazing fashion what they can achieve in spite of the threat, not because of it. Class warfare has been nourished too strongly, and is a threat to the vital unity of labour.

Called into power against its expectations, the present Party has not yet shown that it possesses the necessary calibre of administrators or leaders although, of course, there are notable exceptions.

### **Management and Workers**

On the managerial side, controls and licences and red tape have a most depressing and aggravating effect, but I think it is quite wonderful the way management have tackled their task ; in this, you gentlemen have played your part. I think we are all agreed that some means of control has been essential under the difficult circumstances which have existed, but there is a strong cleavage of opinion between those who want control for its own sake and those who believe (a) that only a measure of control over essentials is necessary, and (b) that planning in detail is impossible.

All present experience indicates that the Government should ensure the effective and efficient working of those controls which are absolutely necessary, leaving the question of detail to the industries concerned.

On the workers' side there have been too many unauthorised stoppages, and although a very large number of individual factories have done extremely well, I wonder if everyone can put his hand to his heart and say "I can't do more than I am doing." Furthermore, we have indulged in a reduction of working hours and therefore increased our costs at a time when we can least afford it. The whole conception of Joint Consultation has improved in principle and in detail, and I would say, taking the broad view, that industrial relations have also improved.

At Margate three weeks ago Sir Stafford made a valuable contribution. You will remember that he said "You cannot impose efficiency either Governmental or Managerial. It has to be the outcome of concerted plans by all the partners in industry." Note the use of the term "all the partners in industry." He made another important point when he showed that even if 25 per cent. of the profits were distributed to the workers, it would mean only 4d. in the £1 on wages.

He also stressed that jointly all the partners in industry have got to achieve better results by brain rather than brawn.

I am entirely in favour of achieving better results by brain, but I would also like brawn and harder work to play its part. As the *Financial Times* leader put it recently, "It would be folly to suppose that additional golden eggs are to be laid without any extra effort on the part of the goose."

Sir Stafford went on to say "We must use our brains in the direction of higher productivity, including the removal of all those old-fashioned rules and regulations that could hamper higher efficiency. In this both sides of industry could and should help." This is a point every one of us would do well to bear in mind.

### Taxation

It is hard to believe that the country can possibly stand the burden of the present volume of Government expenditure and the heavy taxation which is entailed.

Even if it can be stated that industry is well occupied, and that there is full employment, this state of affairs can change almost in a few weeks ; and the national income will fall and the country would literally be crushed by the burden of taxation.

The so-called large profits now being earned by many companies are illusory. Companies with large resources already know that through the fall in the value of money, their reserves have shrunk by 50 per cent. in purchasing power.

The present liquidity can easily turn to one of illiquidity through the rising cost of stocks and plant, and in this respect the profits tax is a serious matter. The situation may arise when fresh demands for capital have to be made on the private investor from his "savings," and the call may fall on barren ground as this individual is a rarity these days.

Coal remains a black spot ; coal is one of our few internal natural resources and without trying to blame anyone, it is a fact that if we could by any means have reached our pre-war output our whole immediate national picture would have been different.

All our difficulties have been increased by the fact that in America prices have risen by 50 per cent., and this means that we are getting far less than we had hoped for even with the dollars we earn on our loans. It may not be too much to say that there will be difficulty in finding a solid recovery on our part until this rise is reversed.

Wage levels provide one of the trickiest of the present-day problems. No one has attempted to grasp the nettle of control, perhaps rightly. Increases since the War have been considerable, and recent events show that the spiral is still going on. You have your White Paper on Government policy, you have heard the arguments at Margate, you have also seen the recommendations

as regards Engineer's Wages. All I would say is that the trend is still slightly upwards without necessarily any increase in productivity.

#### Trend in Industry and Production

These few points which I have just stated are quite straightforward and I hope a true statement of the facts in the picture which exists today, and it might be pertinent to look at the trend of industry and production at the moment. Since the War ended we have all been struggling to get materials, and labour ; it has not been a question of searching for orders, they were there for the taking in spite of rising costs ; most people have had months of work on their books. Is any change taking place ? Is the order book failing ? Are people now beginning to find that it is not quite so easy to get orders, especially export orders ?

Are we getting on top of the production of certain articles or commodities ? Are some companies beginning to find that they are short of cash ? Are some categories of industry feeling the draught ? Are the masses buying consumer goods or are they holding back ?

In fact what I am trying to ask is, have we got to the top of the hill, are we running along a high plateau or are we beginning to descend some sort of trough or ravine ? What in fact now lies ahead of us ?

If I had to answer the question quickly I think I should say that we are still running along the top of the plateau, but there is a good deal of fog and mist about, and for all I know a ravine or gully or a cliff may be ahead of us, which at the moment is not visible. Before I try and guess at what the future has in store there are several other factors I would like to bring to your notice.

A fact which cannot be lost sight of is that our competitors, including some of the European nations who were down and out, are now getting much more active and in certain cases they are working extremely well for very long hours.

On top of everything else there is the Russian situation ; already our economic policy is being disturbed by defence preparations. Frankly, I am thankful to see that we do not intend to let our defence arrangements lapse on purely general grounds. If Russia wants to create world Communism by a cold war, the only possible way for the United States and the Western Nations to maintain their political and economic freedom is to unite in common defence and proceed with utmost speed with the economic restoration and development of our part of the world.

#### Production Efficiency

One obviously important aspect of our future prosperity is our production efficiency, something in which you gentlemen are

prominently involved. The most serious feature of the post-war situation in Great Britain is that the productivity of the country per head is no higher than it was before the war. The Chancellor himself said on August 12th, "The increase in production since 1938 is due in the main to the increase in our labour force rather than to an increase in the productivity of that labour force". It is often claimed that we are behind other countries in methods of manufacture. This in itself is an involved story which no doubt you are arguing out amongst yourselves, but I do feel that comparisons must be drawn with the greatest care as there are many facets to this problem.

Comparisons are made between the organisation of our industries and those of the U.S.A. or elsewhere ; coal and cotton in particular have been cited. It does not always follow that because a particular industry is organised in a certain way in America that a similar structure would work equally well here. If the relative prices of different categories of labour vary, or if the supply of capital is easier or more difficult in the countries being compared, this will affect the way in which the industrialist will organise his production. I am not trying to say that we have not got many lessons to learn ; I used to visit the U.S.A. and Canada every year before the War, and I never failed to come back with some idea or something new to improve our production or methods at home.

The steel workers have nothing to be ashamed of in their increase in productivity over 1938 ; generally speaking the improvement, amounting to 30 per cent, has been due to general keenness, good management and an excellent response from workers in the industry. In the coal industry the productivity, the coal raised per man employed, is lower than it was 30 years ago, when nearly all coal was hewn by hand. I wonder if better houses are being built with less labour than 20 years ago ? Productivity in the cotton textile trades is lower than it was fifteen years ago and lower than in some other countries. Even in America there has been a lag in the increase of productivity since the war.

Nevertheless I agree with the opinion of many American experts that Britain can potentially increase her workers' output per man hour far more than America can, because Britain starts from a lower level. I wonder what will emerge from the Anglo-American Council on Productivity ?

### Technical Education

I have just assumed the Chairmanship of the National Council for Education for Industry and Commerce. Various eminent Committees have already reported on this subject, and there is much conflict of view as to how technical education should be improved. It is far too early for me to express a view, but it is,

however, common ground that we want more and better trained technologists, apart from our plans for training in pure science. Here, again, comparisons are made between this country and America to our detriment, which, on examination, are again subject to factors which are not comparable.

Coming to the question of improved training in management, we can record with enthusiasm the setting up of the Administrative Staff College ; and the British Institute of Management is getting into its stride.

Sir Henry Tizard made some pertinent comments in the Presidential address to the British Association at Brighton recently. He considers, as I do, that we are passing through a state of unstable equilibrium which may continue for some time. He considers that only by maintaining leadership in the application of science can we hope to keep our position. He suggests that in Switzerland, in Sweden, and in America there is a higher average of technology and a much greater proportion of manpower of high scientific education in control of industry. He goes on to argue that the greatest need is for the application of what is already known. Pure invention has its place, but he contends that industrial prosperity will depend more and more on the continuous application of science to industrial practice. In this sphere I hope the new National Council will be able to assist in formulating a plan.

### Commonwealth Plans

Before attempting to outline the future, I feel that we must look at what I might call the Commonwealth complex. In the position I held at the War Office no one had a better chance than myself to see and appreciate how much we owe to our Dominions and Colonies for the help that was given us during the war.

In the last two years I have had the privilege of visiting Canada, South Africa, Australia and New Zealand and some of the Colonies, and, within the limits of time available I saw a certain amount of industry in these countries. They are by no means standing still and the war undoubtedly increased their industrial potential in a manner which could only have happened in about four or five times the number of years of peace. To quote one example in Australia : factory employment has risen from 565,000 in 1938-39 to 800,000 in 1946-47.

If I may try to sum up the Dominions position, it is this : Here are countries (part of ourselves, but separated by water) with unlimited resources, food and raw materials, in varying degrees, in various places. At the moment most of their people live in abundance, whereas we live in the United Kingdom in austerity. They have all the things we need, things which could

be substituted for those for which we now have to find dollars, which we do not possess. It is a common factor that more people, more population, are necessary. The development of primary products can be increased ; in many cases secondary industries have made an excellent start and the urge to be more self-reliant is very strong.

Immigration is being encouraged ; in certain cases displaced persons are being admitted, but the total rate of increase is not generally very large, and certainly not large enough to meet the requirements of industry and defence. From the defence angle in particular these countries can afford the dispersal of both population and industry in a manner which is suitable for the modern conception and methods of war, but they have not the resources to defend themselves without the assistance of the British Army, Navy and Air Forces, and the necessary defence production resources are outside their control.

If the Dominions (and the Colonies) were countries adjacent to the United Kingdom a major re-distribution of population and industry would go on quite normally and the general trend of my argument is that this must go on even in spite of the fact that distance is a major obstacle. It is quite true at the moment that emigration schemes to the Dominions are attracting people rather faster than present methods can deal with them ; there are also signs of movement of industry and capital to the Dominions, and in the defence field we have seen the example of the setting up of the rocket range in Australia as an Empire unit. Other schemes are going ahead for the development of food in Africa and elsewhere. The main point is that all these things are not bold enough ; the momentum is not big enough.

I would like to be a little more specific as regards one industry which I saw in some considerable detail, and that is the steel industry run by the Broken Hill Proprietary Co., probably the biggest integrated unit in the world today. This company has the wonderful advantage of great ore supply of high iron content, but the whole structure of the company is a model which any one of you would be interested to examine, e.g., the method it employs both for quarrying its ore and transhipping and moving it in its own ships, the operation of its own coal mines, which are essential to the undertaking, the steel furnaces themselves and the processes which deal with every form of steel from heavy sections down to wire and nails. It is a very fine organisation, well lead, well managed, and I would think that it must be the cheapest steel producer of any country in the world today.

Mr. Essington Lewis, who is the driving force in this great B.H.P. organisation, sent me a copy the other day of a lecture he gave in

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Adelaide in June on the importance of the Iron and Steel Industry to Australia ; it is an enlightening document. He quoted the following prices as at January, 1948 :—

|                  | U.K.    | U.S.A.  | Australia. |
|------------------|---------|---------|------------|
|                  | £ s. d. | £ s. d. | £ s. d.    |
| Foundry Pig Iron | 12 3 6  | 11 5 0  | 6 15 0     |
| Merchant Bars    | 24 9 5  | 20 6 0  | 14 2 8     |

All these in Australian currency.

English prices delivered prices at consumers' works.

American prices for delivery F.O.B. at various basing points.

Australian prices C.I.F. main Australian ports.

### The Future

We now come to much the most difficult part of my talk : the future. Britain is rather like a sick person to whom a narcotic has been administered to deaden the pain, whereas a major operation is required, and it must be *sine qua non* that we have a good surgeon (a good leader) who knows the whole job. In spite of the cheering news Sir Stafford gave us recently, at the present rate of progress and with some of the existing policies there is no positive certainty that Britain's industrial future is secure, but given a course of action, which I will try and lay out for you, I believe we can and will get through. Some of the courses open to us are short term, the second category are what I might call progressive or continuous and even long term.

As I consider it the most important I put unity first ; unity amongst the Commonwealth nations and unity in our own United Kingdom. At no time even in 1939 was there more reason to have it, at no time were the elements of disunity greater, particularly at home. Somehow or other the wartime unity of this country has got to be rediscovered, and it can be if people realise how dangerous the situation is. Can you believe for one moment that America does not want a strong British Empire ? The Dominions are no longer children ; they are grown up ; that does not mean they love the Mother Country less, but they have ideas of their own as well.

As I heard Mr. Robert Menzies put it the other day—Why be ashamed of the word " Empire," why be ashamed of the word " block " in describing the United Kingdom and its children ? We shall only succeed if we are a block, not only for ourselves, but for humanity.

You have heard something about leadership from one very qualified to talk on the subject. It is one of the things that has been lacking in the last few years, it is something which is essential to pull us out of the morass. Good, fearless leadership will help to promote the unity I have advocated.

Reduced taxation is essential. We must all have a carrot dangled before our noses. Quite apart from the question of incentive, the present level will create disaster if the ravine I have suggested earlier in my talk becomes a reality.

With regard to improved social services I shall be the first to welcome whatever improvement can be made possible in the living conditions, welfare or security of "John Citizen," but we are a bankrupt nation at the moment, we cannot afford these things all at once, and they will be better administered and more enjoyed if they are brought in over a period of years.

On the question of nationalisation, moderation should prevail. The question of nationalisation of coal need not be a question of political controversy. Some industries may lend themselves to public ownership, but where it has been done we should make doubly sure that they operate with maximum efficiency and that they recognise the necessity for maximum production. Steel, and whatever may be brewing up to follow steel, are different matters. I do not propose to argue the steel case here, except to say that for the Government to go into the ring and dislocate everything that has been done in this famous industry by threats of nationalisation will strike a blow not only at steel, but at every other industry which is dependent on it.

Increased production at home applies to everything, including productivity of foodstuffs. It is something to which everyone pays lip service, but in many cases it is not taking place. Its achievement must depend on the creation of unity which I postulated in my first point and also on the following points :—

- (i) Harder work and longer hours.
- (ii) *Abolition of restrictive practice by everyone, employer or employee.*

The Chancellor himself has, as I have already stated, advocated the first and the last ; I still feel that brawn must play its part, and it should not be shameful, but a proud act in an emergency to work harder and longer until we can look our friends in the face, especially those friends who are lending us money to restore our prosperity.

### **Wages Must Depend on Profits**

Nothing can be wrong with high wages if they are earned; equally the minimum wage should be something which gives the ordinary man his chance to live happily in his surroundings. The level of wages which can be paid must depend on the profitability of enterprise, public or private, and the balancing of the National Budget.

As we are an exporting nation, the level must be such that we can sell our goods. The value of real wages has increased since

1939, and the Chancellor has exploded the idea that there is much more to be gained in wage rates by milking profits. It must follow, therefore, that except for minor adjustments, we cannot afford higher wages unless at the same time productivity can be increased. I have already pointed out that this can be done by unity, by brain, by harder work, and by longer hours.

I have earlier referred to controls. There must be thousands of people who are now employed in this service who if liberated could improve our production. Formulation of economic and financial policy has resided too much in the hands of Government. As Lord Bruce said two weeks ago, "We have the representatives of labour and of employers, but they are only coming into the picture as consultants to Government. I believe we have got to get industry itself to take hold of this problem and work much more as one great body."

There may be something in this conception. Another great factor in control is, of course, the question of convertibility of sterling ; we are now so hedged in that we have forgotten what it is like to travel freely, to trade freely, to buy or sell shares or goods. Is it conceivable that convertibility should precede general stability rather than that we should wait to achieve the stability (which is not yet on the horizon) before we get convertibility.

There are within the Empire certain raw materials which we can sell for hard currency ; coal I have mentioned, and the lamentable failure to reach our pre-war outputs is to be deplored. Within the Empire we have many others, for example oil, tin, rubber ; these are certainties, and everything possible should be done to improve their production.

Let me now turn to some of the progressive or continuous courses of action which are necessary, starting now and increasing in tempo.

### **Emigration and Colonial Development**

The transfer of millions over a period of years presents great difficulties, but if my conception of Empire strength is correct, it entails a scheme on the grand manner in conjunction with the Dominions and Colonies. Much is being done, but the tempo must increase. We have got to face a planned emigration not of a certain group of people, but of whole communities, the children, the fathers, the mothers and grandparents, those who can do things and those who must be supported. We can relieve the demand for imported foodstuffs by a decrease in our total population, and we can afford some reduction in our own productive effort. Of the total population in the United Kingdom about 40 per cent. are the labour force ; arithmetically, it is not impossible to work out how many of the total population should leave and to what

extent imports from our own Dominions should be increased ; similarly one can plot the drop in expenditure overseas against the decrease in exports which could result from less productivity at home. It is, of course, much more complicated than an arithmetic sum, and various factors have to be taken into account.

Firstly, people must accept the idea and be prepared to go. Secondly, the reception arrangements at the other end must be good. Thirdly, all industries are different ; i.e., you have to discriminate between those industries which produce large export values with minimum labour cost and those which do not. Fourthly, the defence angle has to be considered. Now the strength is here, and we are weak in the Dominions ; anything which makes us weak everywhere is useless.

It is traditional that the Englishman loves his home and there are many of us who feel that England is and always will be the best place to live in. It may be that the magnitude of the operation which is contemplated is a deterrent. We had schemes of this size in the war and we did not flinch in carrying them out. I do not know how many people were transported from the United States and eventually to France and back again, in addition to stores, equipment, and escorts, but it was done, just as something on the scale I am visualising could be done if the project was tackled in a manner comparable with an operation of war—by leadership both here and in the Dominions. It is not a good argument to say that this will mean the decline of the United Kingdom ; it will decline anyhow unless something is done, but I fully realise that the elevation of some of the Dominions to a potential which approaches nearer that of Britain, does call for great statesmanship and political harmony.

### **Improved Technical Training**

This is both a short and a long term policy. From the industrial and defence point of view we have a long way to go. It is a highly complex subject and gives rise to many views as to procedure and objective. No revolutionary method will succeed, but as I am personally concerned with the whole scheme, I can only assure you that it is being pushed ahead and I hope that we shall achieve what is wanted, i.e., more and better research people, applied scientists, technologists and technicians.

### **Improved Training in Management**

You have the new Administrative Staff College at the top end of the scale ; an effort by private enterprise, which I have seen for myself and which has started well, and the British Institute of Management which is now under way, and involves the co-ordination of all the excellent but dispersed activities of many bodies

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who tackle many facets of management. More and more there is the tendency to include the teaching of management and administration at Universities and Colleges. This is a long term effort which must not be relaxed.

**Removal of Food Subsidies**

At the moment we live in a fool's paradise. Subsidies must obviously be removed as soon as possible, but it needs someone much more skilful than I am to argue this proposition where sudden removal could mean inflation. I should be disappointed, however, to feel that within five years we cannot remove what is a misleading and artificial state of affairs.

This brings my talk to an end. The outlook is a little grim, but not without hope. I would ask you not to be depressed. I saw too much of "John Citizen" in the War to believe that we are decadent. The spark of initiative, of daring, is still here if someone could light it. I am not suggesting that Governments cannot do something positive in the industrial field, but it should be limited.

In the end industrial efficiency must depend on the initiative and intelligence of management and workers and on the existence of an environment which is congenial and provides incentive for enterprise.

Governments should remove and not impose barriers to initiative ; it cannot compel us to be enterprising or make us exercise those qualities upon which our former greatness depended. That is up to us, up to you, to me, and many like us, and I hope we shall not be found wanting.

The President said members had signified quite clearly by their applause what they thought of Sir Ronald Weeks' address—brilliant, scintillating, inspired by a touch of humour. He had given them all points to think about and to try to use. A more formal vote of thanks would be passed later in the proceedings. At that stage, he would like simply to say to Sir Ronald, "Thank you very much for your wonderful address."<sup>22</sup>

## REPORTS BY CHAIRMEN OF DISCUSSION GROUPS

The President then called upon the Chairmen of the Discussion Groups to present their reports.

### *Group 1.—(a) Production Engineering ; (b) Engineering Production.*

Mr. J. E. Hill, Chairman of Council, presented the following report on behalf of Mr. A. McLeod, Chairman of Group 1 :

A wide range of engineering subjects was discussed opening with considerable commentary on the proposal to unify screw threads. This section was fortunate in having in the audience Mr. J. E. Baty, Chairman of the Standards Committee, who was able to answer many queries and to review the background of negotiations with Canada and America on this important matter.

It was emphatically recommended that a telegram should be sent from the Conference to the Minister of Supply outlining the advantages to national output and production problems of close collaboration between the Institution and all Government Departments.

A lengthy discussion ensued upon the value of "paper work" in production, and many subjects for papers to Institution Sections were suggested. It was concluded that all paper control systems should be kept closely under review, and that the expense of installing any such system could only be justified if it actually saved more money than it cost.

### *Group 2.—Speculation and Enterprise as Factors in Planning for Repetitive Production.*

Mr. H. W. Bowen, O.B.E., Chairman of Group 2, presented the following report :

The Chairman opened up the discussion by putting forward guiding points for consideration, such as :

Design of the product for manufacture, including the improvement of design to suit manufacture and tooling.

Type of material and standard components.

Use of special machine tools manufactured especially for the job against the use of general purpose machines.

The effect of the use of the machines in respect of the initial capital involved, and if drastic changes had to be made in the design during the manufacturing period.

Conveyors and layout, storage etc., were to be considered with due note on flexibility during manufacture.

Tool making and tool costs.

Sales and market research.

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The discussion was lively and virile and covered the whole subject matter from capital investment, market research, time of getting into production, standardisation—the comparison of large and small components, to procedure of capital investment, advertising and the propaganda to educate the public, sales effort, the co-operation between designer and salesman and production engineer.

The criticism was made that British firms were not speculative enough.

The stylist and industrial designer were mentioned as essentials in all progressive manufacturing firms.

Standardisation was advocated in one quarter, but others pointed to the dangers of over-standardisation.

At the end of the discussion the Chairman summarised the points of view, and the meeting closed at 3.30.

*Group 3.—(a) Youth in Engineering ; (b) Youth in Industry.*

Mr. E. W. Hancock, M.B.E., Chairman of Group 3, presented the following report :

The discussion opened on the question of the suitable ages for commencing the training of young engineers. It was suggested that more attention should be paid to group reactions and human relationships in conjunction with technical training, and the advantages derived from adequate cultural education were emphasised.

Reference was made to the drive and enthusiasm of youth, which could be tempered and directed into the right channels by the experience and help of the older generation, and it was submitted that young men should be trained to take more responsibility, in order to develop the best qualities for leadership.

It was suggested that if more attention were paid to the selection of boys for industrial training, and more supervision exercised during that training, there would be fewer misfits in industry.

Comparisons were made between conditions of technical training in India and Australia by members representing those countries.

The tendency for boys leaving school to become semi-skilled operatives whereby high wages could be earned immediately, instead of taking some form of technical training, was deprecated. The difficulty of obtaining further education while working in the shops was pointed out, and the suggestion was made that technical training could continue at the Universities, with the student continuing association with Industry.

Finally, it was pointed out that youth was primarily a state of mind, and that education could continue throughout a lifetime, but young people should be trained to regulate their assimilation of knowledge, in the realisation that they could not learn everything.

*Group 4.—The Economics of Quality and Accuracy.*

Mr. E. P. Edwards, Chairman of Group 4, presented the following report :

Having regard to the beautiful weather experienced during the Convention, it was particularly gratifying that such a large number of members and visitors attended and took part in this Discussion, which compared with the subjects dealt with by other Groups, might be thought a little dry.

Following the suggestion in the Chairman's opening comments that quality and accuracy were synonymous, there was not entire agreement, although the majority present appeared to favour this view. It was agreed that consumer preference had very definite bearing on quality, and this in turn affected economics. It was further agreed that other factors were design, inspection and sales influences. Often the question of appearance alone had considerable bearing on economics.

One speaker pointed out that the conception of quality could vary considerably in different countries, and mentioned that in America, for instance, a simple domestic article like an egg-whisk could be purchased by a housewife, used for a few months, and then replaced by a new one, whereas in this country, the housewife would expect to buy a much better article at the outset, would use it for a number of years, and then expect the local ironmonger to get it reconditioned.

Some speakers felt that there was, too often, insistence on closer tolerances than were economically necessary, while others favoured the view that very often wide tolerances would help to cheapen the article without affecting its life or efficiency. They felt also that these conditions could arise from an imperfect grasp of fundamental requirements and a too pedantic view of inspection functions. Frequently those responsible for inspection showed little interest in what might be called "sales resistance."

One speaker referred to economics being upset by the wider tolerances and inferior finish at present operating in sheet metal supplies. Often these were such as to endanger intricate and costly press tools. At the moment there did not appear to be any satisfactory solutions to this problem, due to a variety of causes.

The services of Quality Officers, properly used, should be included in production costs, and not considered as an overhead.

It was generally agreed that standards of quality were not the Production Engineer's responsibility, but rather that his function was to produce economically to standards fixed by reference to consumer and designer. Considerable economies could often be effected by the Designer consulting the Production Engineer at the earliest possible stage in design development.

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Reference was made to the economies effected in suitable instances by replacing general purpose equipment by special purpose machines, which once installed, produced more accurately and consistently. An excellent example here was the motor-car engine.

All present agreed that while not directly within their sphere, standards of quality and accuracy should be carefully studied by Production Engineers, and often this called for their being something more than purely executive engineers.

## RESOLUTION FOR SUBMISSION TO MINISTER OF SUPPLY

The President said he thought everybody would agree that they had had a very excellent Convention. They should now endeavour, as far as possible, to combine their ideas, sum them up and to do something truly constructive and definite for immediate action. The Convention Committee had attempted to sum up the main idea of this in a Resolution. It was no good just to depart from Bournemouth with plenty of goodwill and excellent ideas as to how successful the Convention had been, unless they put some punch behind it. He therefore proposed to read the following resolution :

" This Convention of the Institution of Production Engineers, assembled at Bournemouth, and representing a large number of the country's senior production executives, deprecates the attitude of His Majesty's Government in failing to avail themselves, in the national interest, of the services of the Institution, and reaffirms the offer previously made to His Majesty's Government on behalf of the Institution by its Council. Particularly now in view of the message received from the head of the United States Government Productivity Division, namely, that 'the co-operation of the Institution of Production Engineers is vital in the work of the Anglo-American Council on Productivity,' the Convention again assures His Majesty's Government of their full desire to co-operate, collectively, sectionally and individually, in every way possible."

The President then called upon Mr. A. L. Stuchbery, Chairman of the Convention Committee, formally to move the resolution.

Mr. Stuchbery, formally proposed the adoption of the resolution for submission to His Majesty's Minister of Supply, the Rt. Hon. G. R. Strauss.

Mr. F. P. Laurens (London) said he had great pleasure in seconding the motion.

The President, in putting the motion to the meeting, said it reaffirmed the action taken by the Council. In view of the message received by the Convention from Washington, this action was felt to need still further reaffirmation.

*The motion was carried unanimously.*

The President said he had the greatest possible pleasure in calling upon the Chairman of the Council, Mr. J. E. Hill, to sum up, as far as possible, the proceedings of the Convention.

## SUMMING UP

by J. E. HILL, M.I.P.E., Chairman of Council.

Mr. President, Ladies and Gentlemen :

The privilege falls to my lot as Chairman of your Council of saying the last few words at the conclusion of this, the First National Convention of the Institution of Production Engineers. Let me say at once that having listened attentively to all the speakers and having made a very gallant attempt to digest all that has been said during this Convention, I am sure you will excuse me if I do not cover all the ground and make all the salient points that a Chairman ought to make. I assure you that at this stage of the proceedings I am suffering from a state of mental indigestion.

I propose to be very brief in my remarks, because most of you have had the same opportunity as myself to pay attention to what has been said to us. What therefore are our conclusions ?

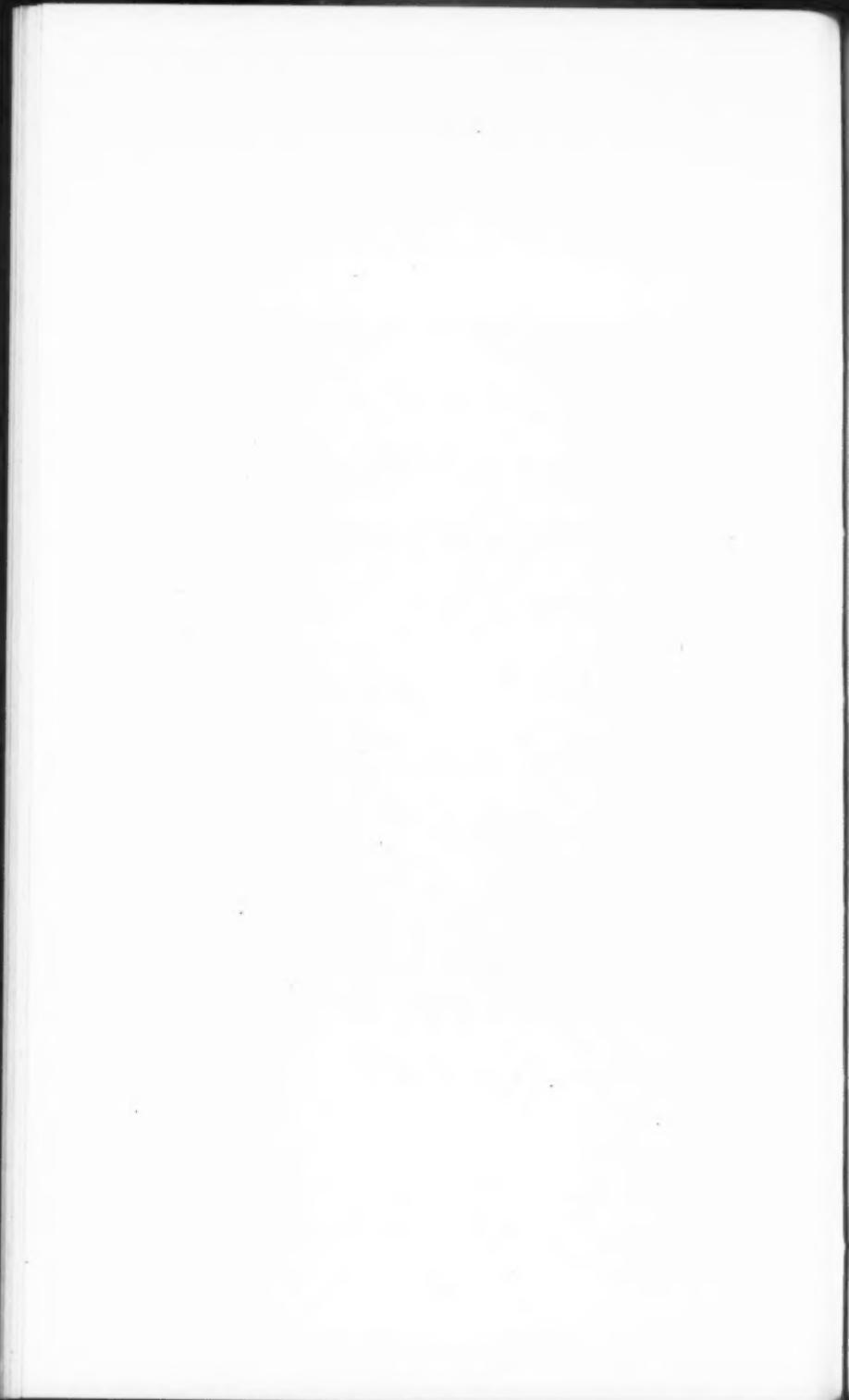
It is rather interesting that all the speakers have stressed the human side of production engineering, and that particular emphasis has been laid on leadership, the relation of the operator to the machine, the improvement of management by the application of proven good practice throughout industry, and greater freedom for the individual in the expression of his individuality through everyday work.

### Leadership

I would like to refer in the first instance to the most excellent address given by General Sir Bernard Paget at the Dinner on Thursday evening. All will agree with him that the qualities of leadership are not easily defined, but that personal experience and the character of the individual play an important part in trying to define what goes to make a leader. All leaders appear to have some qualities in common but there are also wide differences in character and technique. It can be emphasised, however, that no one can be a real leader nowadays unless he understands, and is naturally sympathetic with, the needs, aspirations and outlook of the people he is called upon to lead, and is able to inspire them with the ideals of service before self. A further point is that the mistake is sometimes made of discussing leadership only on the level of the Commander-in-Chief or the Board of Directors, instead of through all the levels of organisation. General Paget emphasised the need, at the other end of the chain, for good platoon and section leaders, and for a sharp " cutting edge." Unless platoon and section commanders have courage, skill and initiative, the cutting edge is likely to be other than sharp and truly tempered. That message is certainly worthy of note by industrialists.



**MR. J. E. HILL, M.I.P.E.**  
**Chairman of Council.**



He stressed the necessity for junior executives or junior leaders to be trained to act for themselves, ready at all times to make full use of their own brains and initiative. Another important passage in General Paget's address was his reference to incentives, where men rightly want to know how they as individuals fit into the scheme of things. They want a clear target to aim at, and as far as is humanly possible they want to be free of the anxiety caused by a sense of insecurity and uncertainty. All ranks must know their place in the team and be made to feel that they have a worthwhile part to play as members of that team.

However, the industrialist in my opinion has a somewhat more difficult job in regard to discipline than the military authorities. Industry does not have the opportunity of taking its operators in the first instance into the Quartermaster's store and supplying them with uniform, thus immediately withdrawing 70 per cent. of the freedom that they knew in civilian life. This may or may not make the job of the Army Commander slightly easier than that of the industrial executive.

### **The Presidential Address**

Of the many Presidential addresses I have listened to in the past, the one that we were privileged to hear yesterday from Dr. Schofield stands out as the most thoughtful and the most brilliantly delivered that it has ever been my lot to hear. Dr. Schofield reminded us that there is a tendency these days to forget that hard work and ingenuity make possible work-saving machines, and that only hard and constant work will continue to improve them ; that today certain people clamour for higher subsidies on more commodities, for softer unemployment cushions, for socialisation of essential services. These things they would substitute for hard work, never realising that effort and skill are needed in order to produce articles upon which they can reasonably expect a return. These are wise words and spoken at a time when all of us would do well to give further thought to what the President had to say to us on this subject.

Dr. Schofield fully supported General Paget in saying that Management was not simply a function of the Board of Directors, or the General Manager, but extended down to the junior supervisors and foremen. If we are to get more efficient production there should be joint consultations between top management and lower ranks of management.

His reference to the fact that progress always springs from the individual was a point worth noting, and I would add here that we as engineers, instead of making excuses for ourselves as some of us have been inclined to do in the past, on the ground that the politicians are interfering with us, should really get down to the

job and realise that we as individuals have the responsibility to work, or in other words, to implement our theories on the shop floor.

### **Industrial Problems**

I am sure that all of you were impressed by Mr. Hancock's contribution in his address on "Britain's Industrial Problems." Nothing made me feel prouder than those words of his, that challenge, "Who dares to criticise the youth of this country? Let them read the full story of the Battle of Britain, or of the hundreds of exploits courageously undertaken by well-trained youth." We should accept his invitation to present-day critics of youth to visit the technical colleges throughout this land on Prizegiving Days, and admire the high technical standard of hundreds of young men and women, and I would add, not only on Prizegiving Days, but on days when classes are in session, when we should see the earnest effort of the students to reach the highest standard of quality in technical ability. These young persons, I am sure, know that technical education is one of the most important tools in their kit and are prepared to see to it that they have this tool of technical education equipped with a sharp cutting edge.

Mr. Hancock stressed that if we as a nation are to be internationally competitive, it is a matter of absolute necessity that our products should be continually reviewed, revised, and re-designed in order that we can take the fullest advantage of the basic scientific discoveries now being made.

The future of the nation's well-being depends on how we work. If we work from our hearts because we want to work, then all is well. If we work from our stomachs because we are driven to work in order to live, then we are no better than dumb animals.

Mr. Hancock, Dr. Schofield and General Paget all emphasised that each individual must be aware of his or her own purpose in the factory before a better understanding can exist between management and workers.

### **The Industrial Future**

General Sir Ronald Weeks, in support of what has already been said by Mr. Hancock, stressed one important point which is apparent to most of us today—the overloading of the industrial machine. Since the war a demand has been created for materials which could not be, and has not been satisfied. This position is greatly exaggerated by the over-ambitious programme of social services, including building. We have tried to do too much with too little and have thereby created bottlenecks, frustration and many changes of plans.

Sir Ronald Weeks and Dr. Schofield have evidently been thinking

on the same lines with reference to the nationalisation of industry. Both gentlemen are of the opinion that nationalisation must be judged on its merits and that so far, the results are far from convincing.

With regard to governmental controls, all speakers agreed that licences and red tape have a depressing effect on industry, and that management would be in a better position to tackle their daily task by going forward wholeheartedly with the day's problems, instead of wasting so much valuable effort in thinking out ways and means of by-passing, for efficiency's sake, the restrictions that beset us.

Sir Ronald also rightly emphasised one of the most important factors with which we have to contend today—that there is nothing wrong with high wages provided they are earned. Equally, the minimum wage should be something which gives the ordinary man his chance to live happily in his surroundings. The level of wages must depend, however, on the profits of enterprise, public or private, and the balancing of the nation's budget. It follows, therefore, that we cannot afford higher wages unless at the same time productivity can be increased.

Both Sir Ronald Weeks and Mr. Hancock, having had long experience in dealing with "John Citizen," are certain that he is by no means dead or about to lie down. The spark of initiative in our people is still there, but we need leaders to ignite that spark.

Briefly, I would draw your attention for further interest and consideration to some of the points that have been stressed by all the speakers at this Convention :

1. Leadership can and must be developed not only in the Board Room but right through industry down to the foreman and charge hand.
2. All individuals have a right to be informed of their places in the industrial scheme of things and their responsibilities. May I stress here that all are in agreement that hard work and ingenuity have made possible the amenities we enjoy today, and only hard work and enterprise by all will improve those amenities.
3. If the industrial leaders of this country had a greater opportunity of bending their backs to the difficult task ahead of us, free from many of the irritating controls that we experience at the moment, this country would be a much more efficient and effective force in the world than at present.

Finally, I would like to pay a sincere tribute to the unobtrusive efficiency and hard work of the permanent staff which made this venture possible.

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The President said that the *First National Convention* of the Institution of Production Engineers had now been brought to a close. It would be noticed that he stressed the word "first." He felt sure all who had attended the Convention had appreciated the hospitality that Bournemouth had offered them and the fare that the Convention Committee had provided. The weather had been happily kind, and this would remain in all their memories, he hoped, as a successful Convention. He hoped, too, that they would come to a further Convention with renewed strength and vigour and in enlarged numbers.

In their thanks they must not omit their Chairman of Council, Mr. J. E. Hill. They were all very grateful to him for the part that he had played.

Finally, the President repeated his farewell, and sincerely thanked those present for their attendance.

*The proceedings then terminated.*

## A BRIEF HISTORY OF THE INSTITUTION

### Formation and Growth

During the First World War the unprecedented demand for the supply of armaments entailed a complete revision of methods of production. This brought together a small body of engineers whose aim it was to discuss the many complex problems which then constantly arose, and to devise a means of exchanging ideas on production problems generally. As a result of these meetings and discussions the Institution of Production Engineers was founded in London in 1921. Many of its original members, who were corporate members of the older engineering societies, were intent on influencing the training and developing of young men destined to become production executives. The Institution became an incorporated body in 1931 and was granted armorial bearings in 1937.

Mr. J. D. Scaife, Sir Alfred Herbert, K.B.E., Mr. Tom Thornycroft, the late Lord Austin, the Rt. Hon. Lord Sempill, A.F.C., the Rt. Hon. Viscount Nuffield, G.B.E., M.A., D.C.L., Sir George Bailey, C.B.E., and Sir Robert McLean are amongst the Institution's distinguished Past Presidents.

The senior membership is comprised almost entirely of highly placed industrial executives and contains many individuals of outstanding academic and technical attainments.

The rapid growth of the Institution necessitated the establishment of permanent headquarters, and through the generosity of Lord Nuffield the lease of 36 Portman Square, W.1, was acquired in 1938. The building was badly damaged by enemy action in March, 1944, and subsequently the Institution occupied small temporary premises at 10 Seymour Street, W.1. In recognition of the Institution's important work, H.M. Government granted licences for the reconstruction of the headquarters, and 36 Portman Square was reoccupied in June, 1948.

The government of the Institution is of a democratic nature and its affairs are conducted through self-governing Sections or Branches, established throughout the British Commonwealth.

The first Section was opened at Newark-on-Trent on 13th February, 1922, followed immediately by a Section at Coventry. Since then, 26 Senior and 9 Graduate Sections have been formed throughout the United Kingdom. The Institution's activities in the Dominions are governed by Sub-Councils which have been established in Australia and South Africa. In Australia there are Sections in Melbourne and Sydney.

The South African Sub-Council owes its origin to the amalgama-

tion of the South African Association of Production Engineers with the Institution in 1947. In India, a Section of the Institution has been formed in Calcutta.

Local Sections hold monthly meetings, when papers dealing with production engineering and managerial problems are read and discussed, outstanding papers and discussions being published in the Journal of the Institution. In addition to the normal monthly meetings, regional conferences dealing with specific production problems have been organised, the most notable recently being the Conference on National Productive Efficiency in March, 1947, and the Production Per Man-Hour Conference in May, 1948. Both of these conferences were held at Wolverhampton.

### **Research**

A Research Department was established in 1939 when the Governors of Loughborough College generously made available spacious laboratory premises for this purpose. The tremendous impetus given to production engineering research as a result of the Second World War made necessary the establishment of an entirely separate research organisation on a national scale. The Institution in collaboration with H.M. Government through the Department of Scientific and Industrial Research, the Gauge and Tool Makers' Association, the Machine Tool Trades Association and the National Federation of Engineers' Tool Manufacturers, established the Production Engineering Research Association of Great Britain, which was inaugurated in June, 1946, and now operates from its own headquarters at Melton Mowbray. In addition to the intensive research on production engineering carried out during the recent war, the Institution rendered valuable service not only to its members and affiliated firms, but also to H.M. Government at the request of various Ministries and Departments.

### **Technical Education**

The Institution has always taken an active part in the development of technical education, and a Higher National Certificate in Production Engineering was implemented in 1942 by the Ministry of Education in collaboration with the Institution. Courses for this Certificate, which gives considerable exemption from the examinations of the Institution, are now conducted in senior technical colleges throughout the country. Further development in this respect will take place in 1950, when an Associate Membership Examination will be introduced.

The Institution appointed a full-time Education Officer in February, 1948, to establish and maintain the closest possible collaboration with Government departments, local authorities, educational institutions, professional bodies and industry. Other

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duties include co-operation with technical colleges in the development of subjects related to production engineering, and with the Education Committee in the formulation of a progressive educational policy. The Education Officer represents the Institution as Joint Secretary on the Committee for the Higher National Certificate in Production Engineering.

The Institution has, in addition, made substantial contributions to various national committees and many of its recommendations were embodied in the Percy Report of the Ministry of Education, published in 1945, and in the report, Education for Management, which was published in 1947 and has become known as the Urwick Report.

**Hazleton Memorial Library**

In 1946, it was decided to establish a library and information service in memory of the late Richard Hazleton, the Institution's first full-time General Secretary, appointed in 1929, who died in office in 1943. Plans are now being made to inaugurate the library at 36 Portman Square.

**Other Activities**

The Institution was represented at a series of conferences on the Unification of Screw Threads between Great Britain, Canada, and the United States of America, which culminated in the Ottawa Conference of 1945, in which two prominent members of the Institution took part.

It is gratifying to record that the Institution has developed very rapidly both in stature and membership, the number of members having been considerably increased during the last three years. The membership now exceeds 7,000 and is increasing at the rate of 1,000 per annum. At the same time the highest standard of qualification for membership is being strictly maintained. In the direction of its affairs, the most progressive measures are being introduced which must inevitably lead to the Institution playing a vital part in the industrial recovery of the country.





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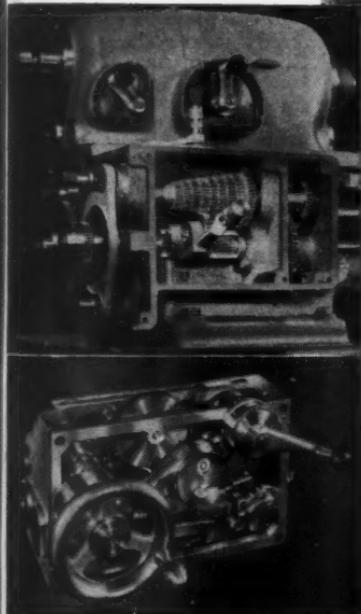
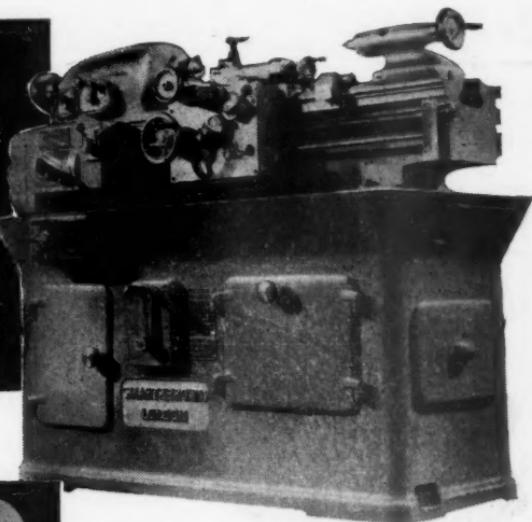
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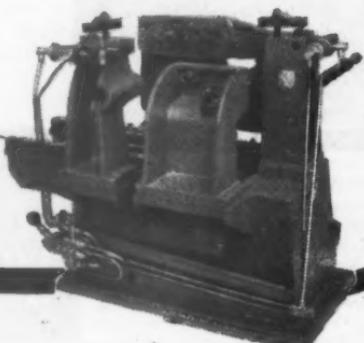
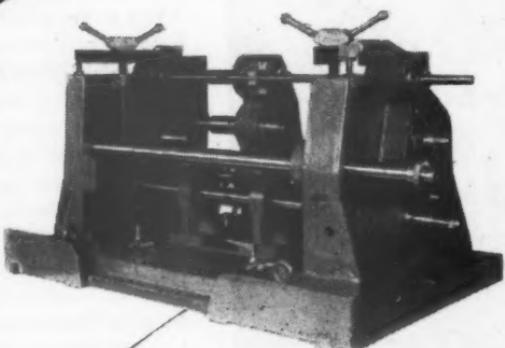
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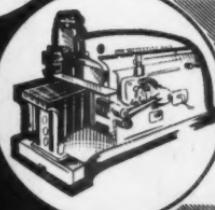
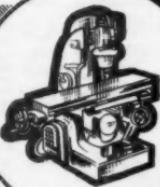
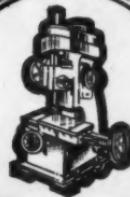
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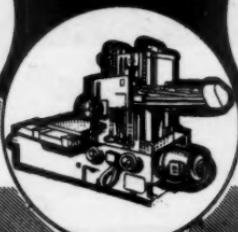
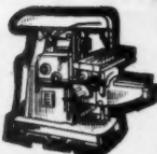
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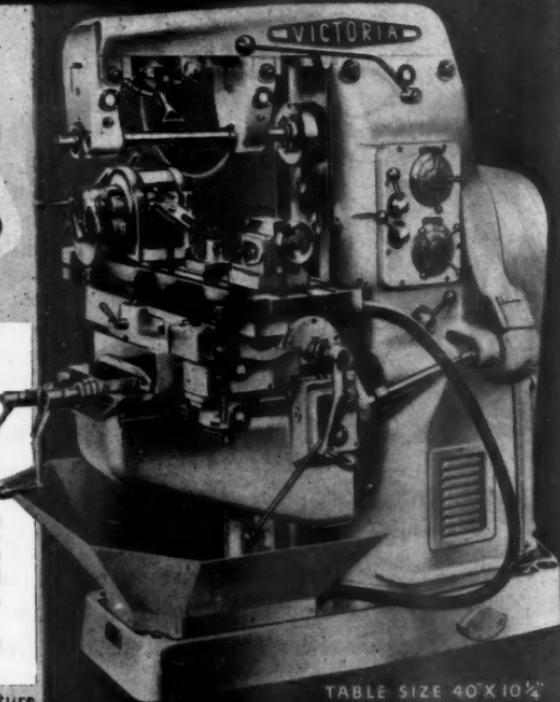
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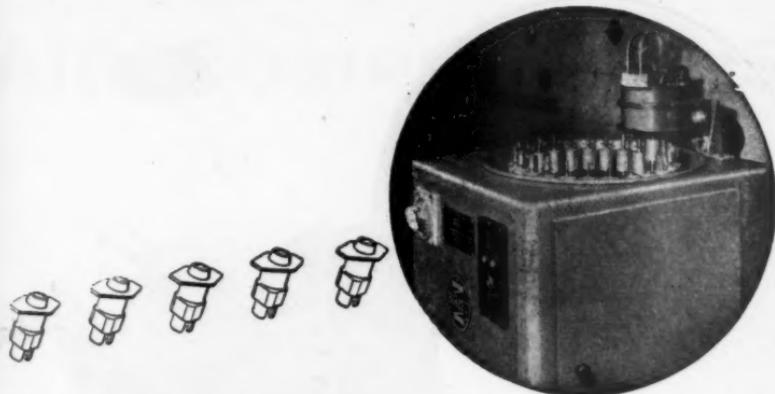
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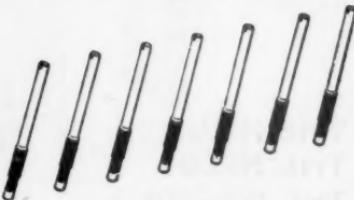
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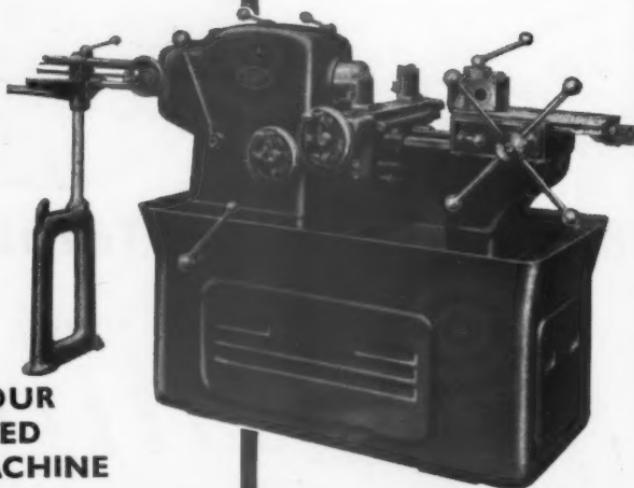
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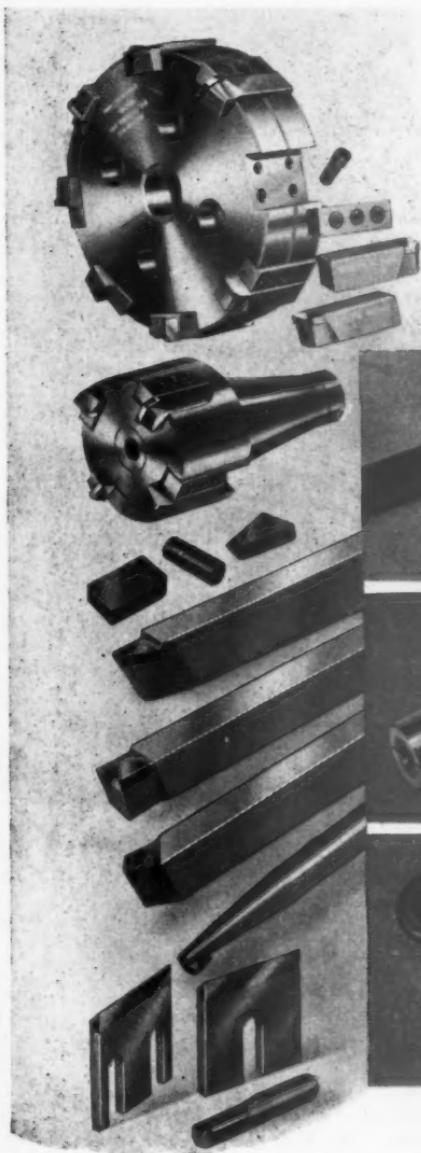
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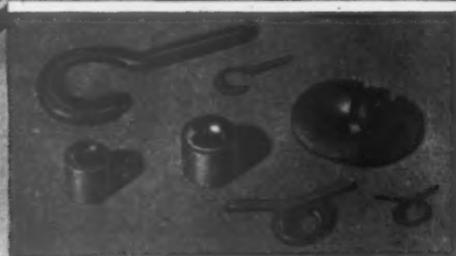
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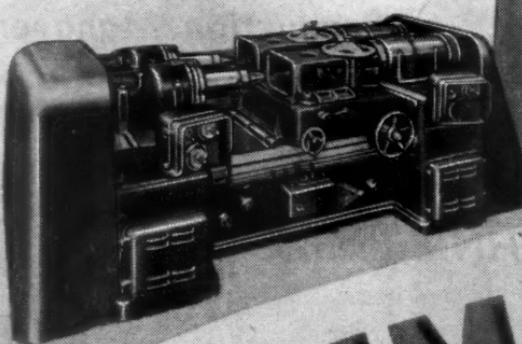
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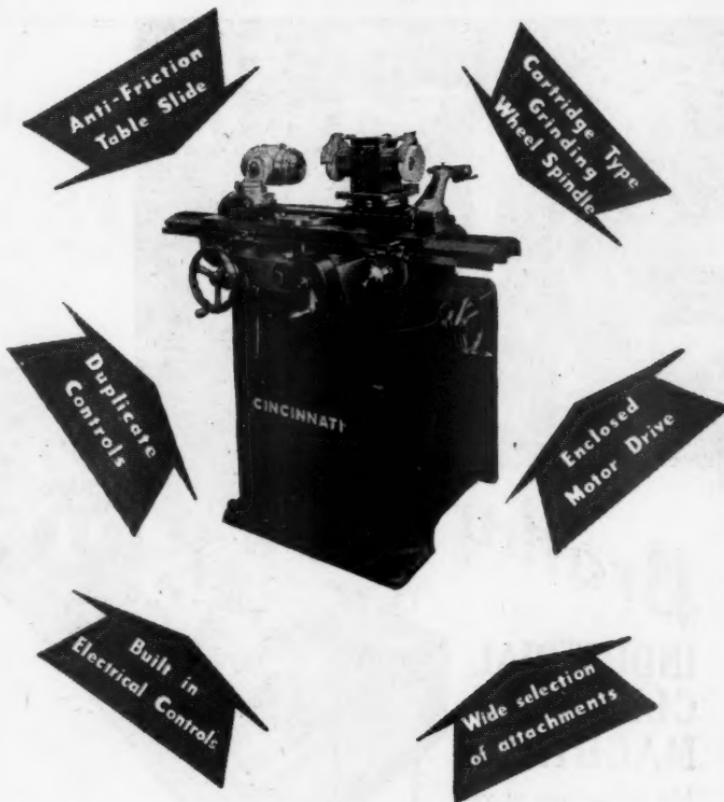
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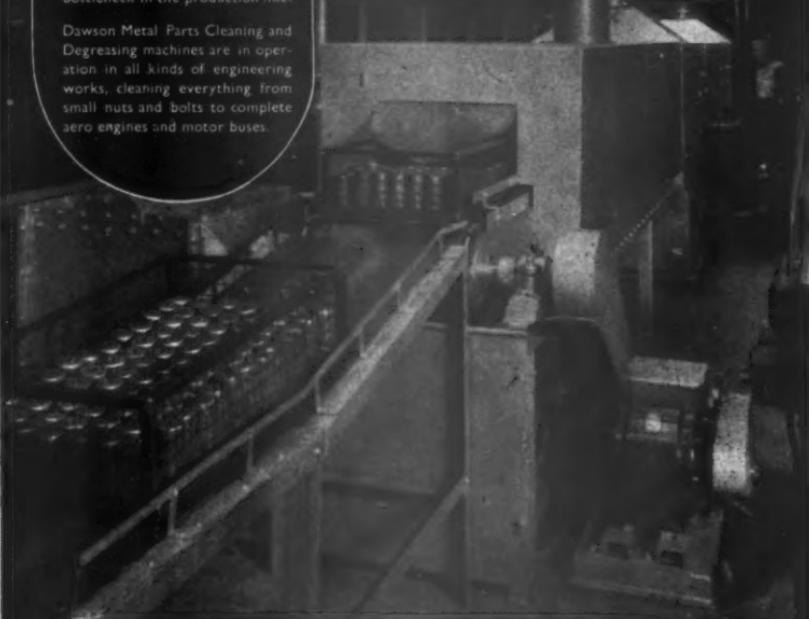
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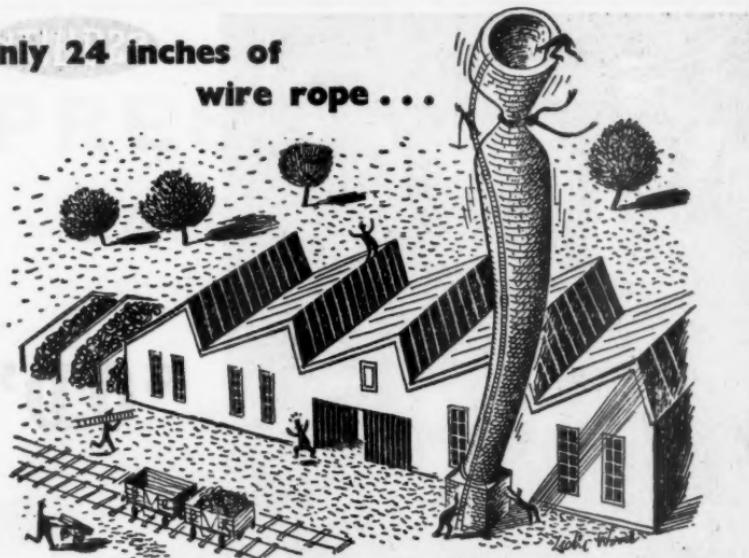


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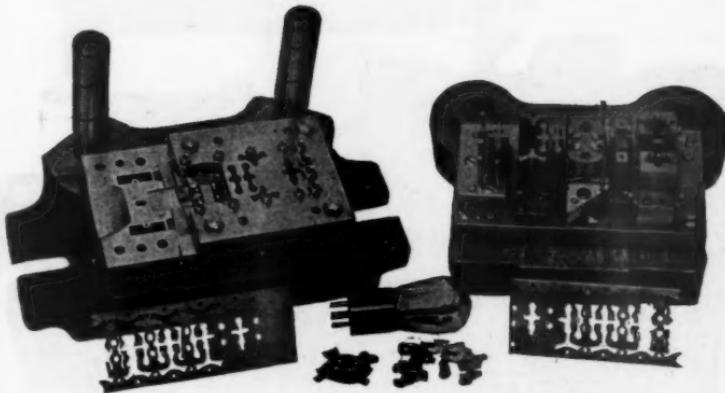
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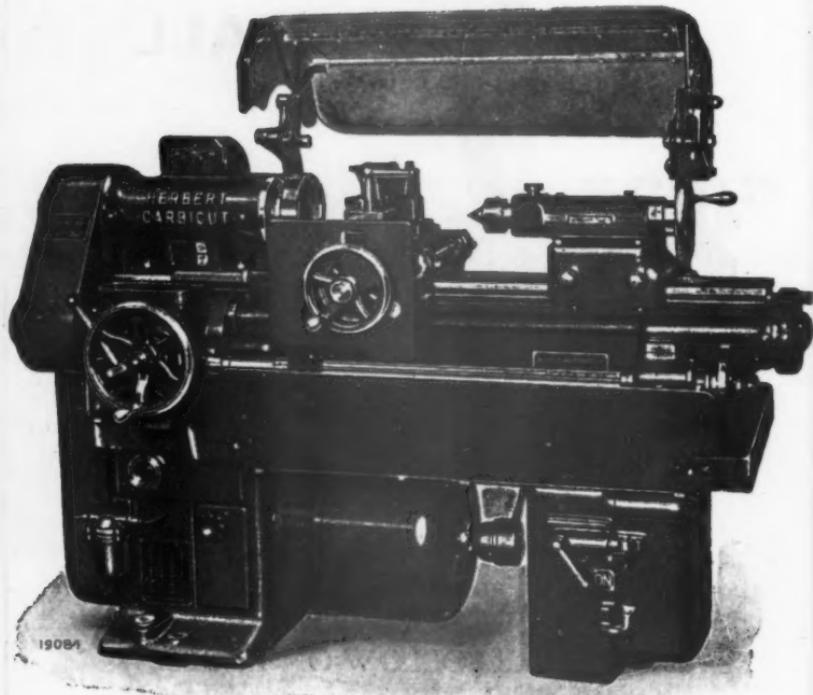




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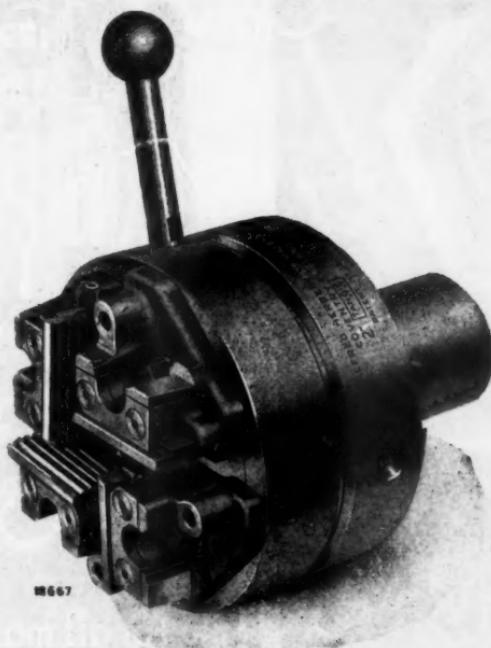
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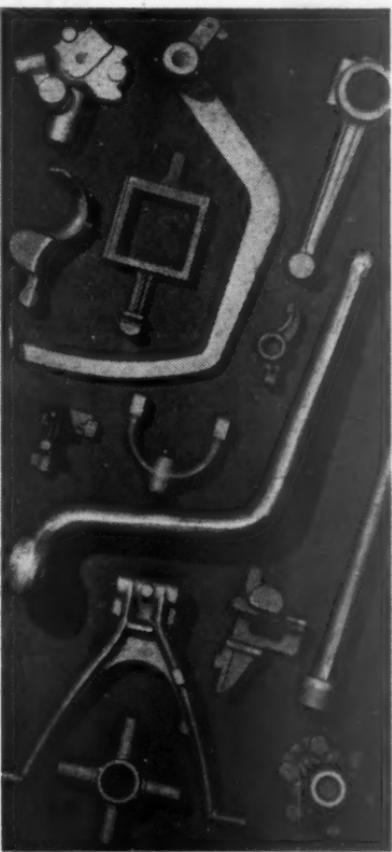


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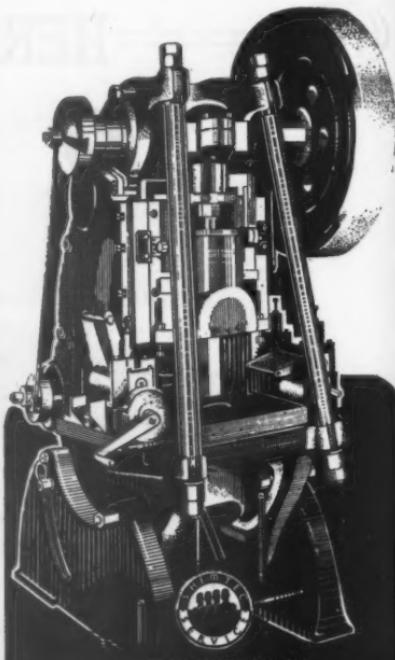
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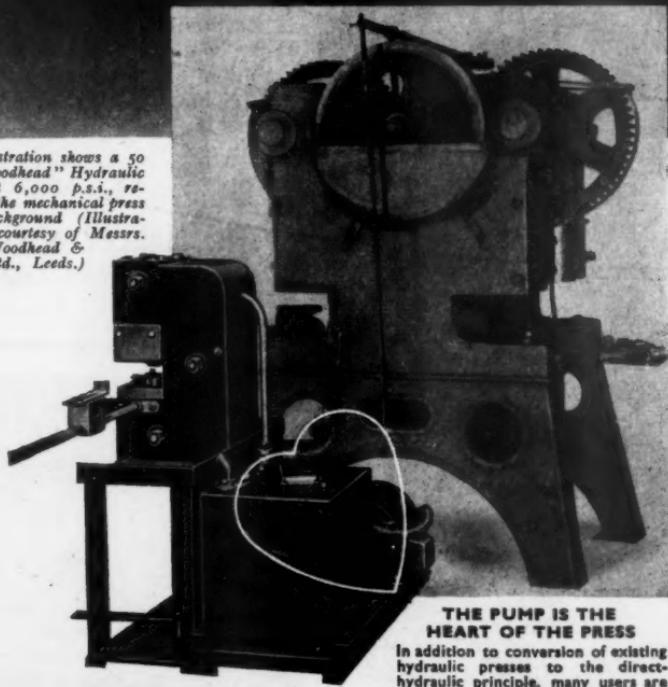
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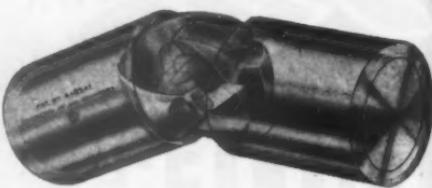
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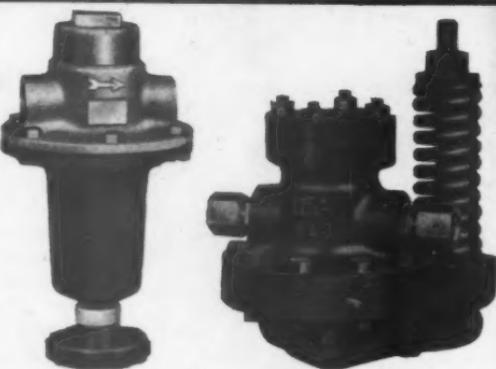
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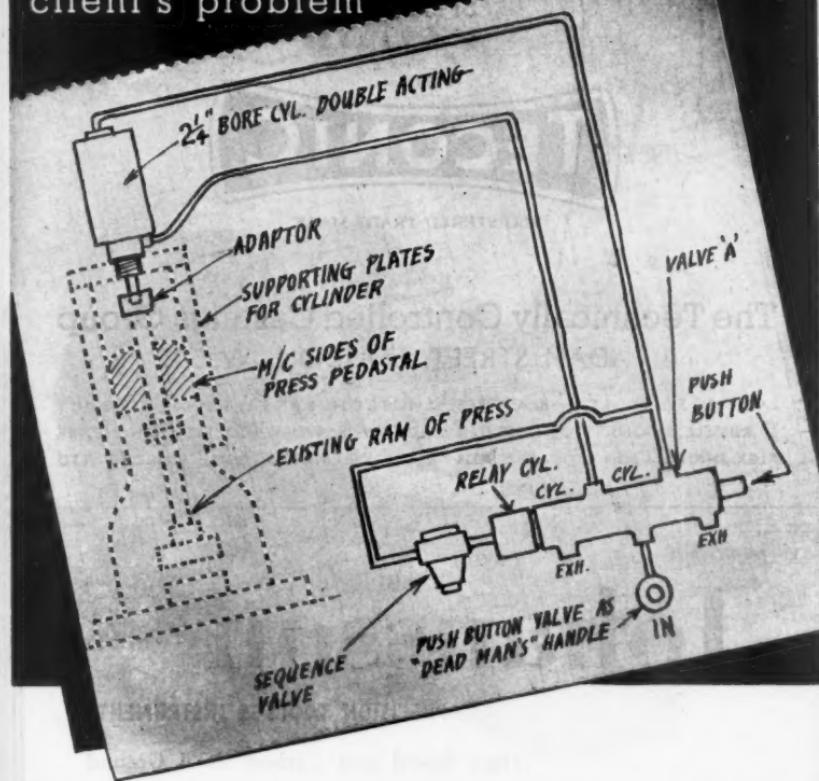
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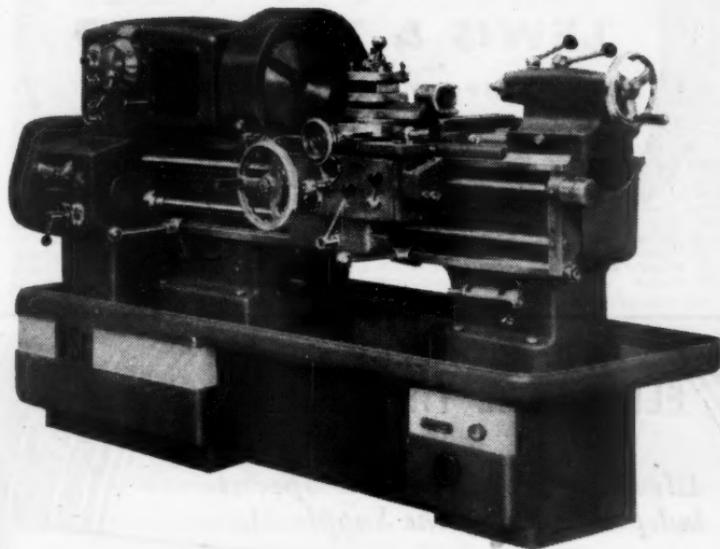
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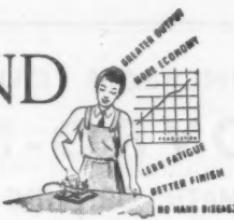
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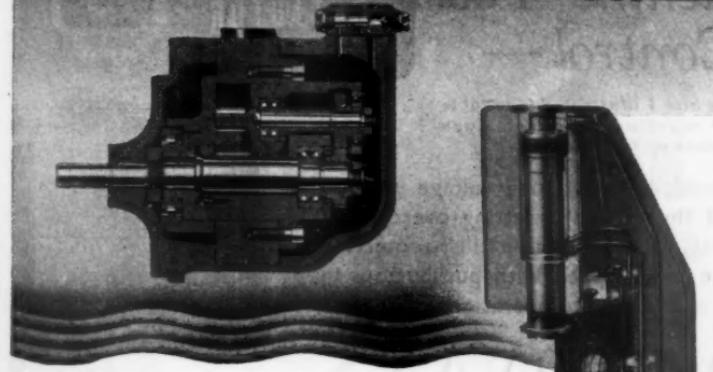
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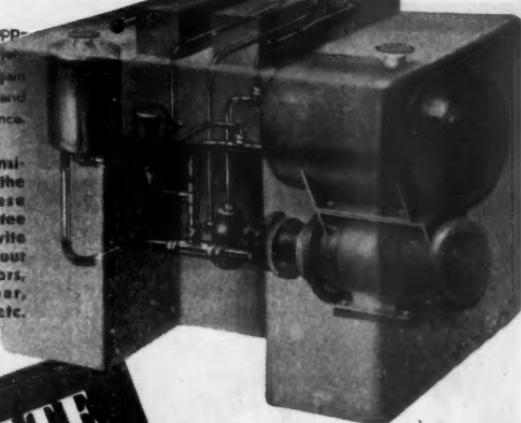
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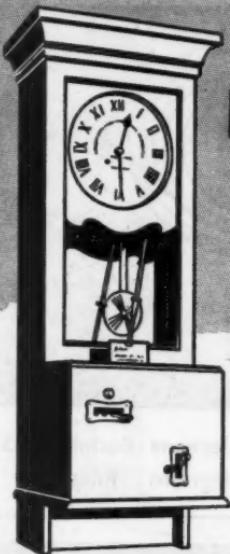
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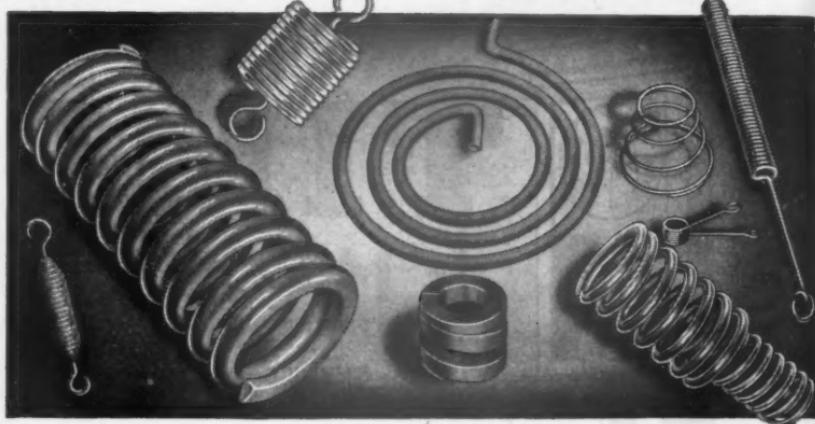
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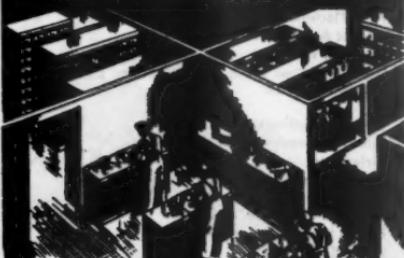
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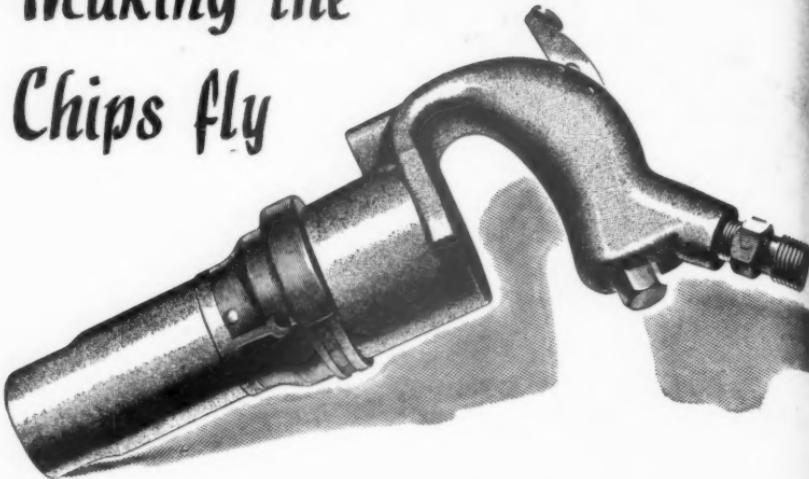


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